

CHAPTER 3.3

Biological Resources: Fisheries and Aquatic Habitat

This Chapter discusses the existing environment of the Scott River watershed (Program Area) with regard to fisheries resources and aquatic habitat; identifies potential impacts on fisheries resources and aquatic habitat in the Scott Valley related to the Scott River Watershed-wide Permitting Program (Program); and proposes mitigation measures for those impacts determined to be significant. The Program Area supports one special-status¹ fish species, coho salmon (*Oncorhynchus kisutch*), and six CDFG fish species of special concern²: Chinook salmon (*O. tshawytscha*); steelhead (*O. mykiss*); Klamath River lamprey (*Lampetra similis*); river lamprey (*L. ayresi*); Pacific lamprey (*L. tridentata*); and Miller Lake lamprey (*Lampetra minima*).³ Other native fish species known to occur in the Scott River watershed include Klamath smallscale sucker (*Catostomus rimiculus*), speckled dace (*Rhinichthys osculus*), and marbled sculpins (*Cottus klamathensis*). However, particular attention in this Draft Environmental Impact Report (EIR) is given to coho salmon because: 1) coho salmon in the Program Area are listed as threatened under the California Endangered Species Act (CESA) and the federal Endangered Species Act (ESA); 2) the Program is intended to provide incidental take authorization for coho salmon pursuant to CESA, and to implement key coho salmon recovery projects; and 3) the other fish species identified above are dependent on a similar range of aquatic habitats as coho salmon. Hence, any impacts the Program could have on those aquatic habitats that could affect coho salmon, could also affect those other fish species, although the significance thresholds for those species are much higher.

¹ For the purpose of this document a “special-status species” is any species that meets the definition of “endangered, rare or threatened” in CEQA *Guidelines* § 15380 (fully defined in the Glossary). Some CDFG species of special concern are special-status species. Such species are referred to as “special-status species” in this document.

² “CDFG species of special concern” are those species that CDFG has determined are either declining at a rate that could result in listing or historically occurred in low numbers and known threats to their persistence currently exists (See the Glossary for a complete definition). Some CDFG species of special concern are “special status species” because they meet the definition of “endangered, rare, or threatened” in CEQA *Guidelines* § 15380. For the purpose of this document, CDFG species of special concern that are also special-status species are referred to as “special-status species,” while CDFG species of special concern that are *not* also special-status species are referred to as “CDFG species of special concern.”

³ Although not officially a CDFG fish species of special concern, the Pacific lamprey and Miller Lake lamprey are treated as such for the purposes of this Draft EIR.

3.3.1 Setting

Regional Setting

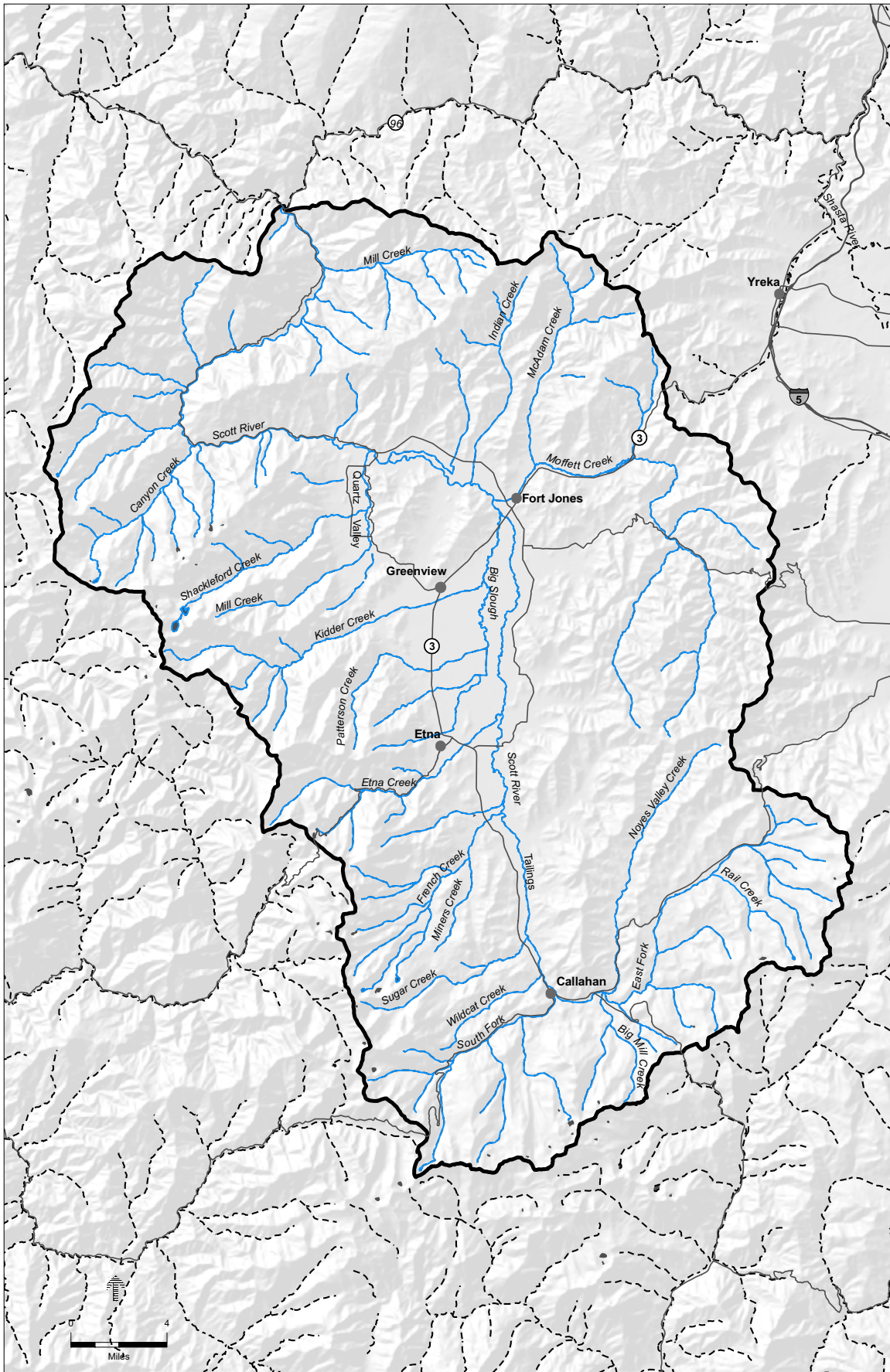
The Scott River, located in Siskiyou County in Northern California, is one of four major tributaries to the Klamath River. The Klamath River is California's second largest river, draining approximately 15,600 square miles (of which 3,600 square miles are considered non-contributing) in California and Oregon with approximately 1,832 miles of waterways (Ayres and Associates, 1999; CDFG, 2004a). Major tributaries include the Trinity, Salmon, Scott, and Shasta Rivers. Numerous other tributaries enter the Klamath River along its length.

Past and ongoing agricultural and hydroelectric development and use of the water resources in the Klamath Basin have degraded water quality of the Klamath River and its tributaries, reduced total annual discharge, and altered the magnitude, timing and duration of flow so that more water runs downstream in the Klamath River during winter months and less during the spring and summer than occurred prior to such development. Problems facing anadromous salmonids, including coho salmon, include an altered hydrograph, high summer water temperatures, reduced and degraded habitat, lack of access to available habitat, erosion and sedimentation, degraded condition of riparian vegetation, depleted large woody debris (LWD), unscreened water diversions, legacy impacts from historical timber operations and mining, and agricultural conversion (CDFG, 2004a). Other water quality conditions, such as low dissolved oxygen concentrations, high nutrient loads, and toxic algae associated with reservoirs have also resulted in aquatic habitat degradation that include the prevalence of fish diseases and parasites.

One outcome of the impaired conditions in the Klamath River was a major adult salmonid mortality event that occurred in the fall of 2002. At least 33,000 adult salmonids died during mid-to late-September 2002 in the lower 36 miles of the river (CDFG, 2004b). Fall-run Chinook salmon were the primary species affected, but coho salmon, steelhead, and other fish species were also lost. The primary cause of the fish-kill was a disease epizootic (CDFG, 2004b). Several factors contributed to stressful conditions for fish, which ultimately led to the epizootic, including low river flow, an above-average number of Chinook salmon entering the Klamath River between the last week in August and the first week of September 2002, and a low volume of water in the fish-kill area. Fish passage may have been impeded by low-flow depths over certain riffles or a lack of cues for fish to migrate upstream. The high density of hosts and warm temperatures created ideal conditions for pathogens *ichthyophthirius* or "ich" (*Ichthyophthirius multifiliis*) and *columnaris* (*Flexibacter columnaris*) to infect salmon.

Scott River Watershed

The Scott River enters the Klamath at River Mile (RM) 143 at an elevation of 1,580 feet and drains a watershed area of approximately 520,600 acres (812 square miles). Major tributaries to the 58-mile long Scott River include Shackleford-Mill, Kidder, Etna, French, and Moffett Creeks and the South and East Forks of the Scott River (**Figure 3.3-1**). The Scott River is part of the Klamath Mountain Province, which encompasses land in both Southern Oregon and Northern California.



SOURCE: ESA, 2007

Scott River Watershed-Wide Permitting Program . 206063

Figure 3.3-1
Scott River Watershed

The Scott River watershed is bounded in the southwest by the Salmon Mountains, to the west by the Marble Mountains, to the northwest by the Scott Bar Mountains, and to the east by lower hills collectively known as the Mineral Range. The Scott River originates in Scott Mountains to the south. Annual precipitation varies from 18 to 85 inches in the Scott Valley, but in the rain shadow of the Salmon and Marble Mountains rainfall amounts can reach 125 inches. The Scott River is an inland drainage with warm, dry summers and cold, snowy winters. Summer temperatures at Fort Jones peak at about 32°C (90°F) in mid-July and minimum winter temperatures are approximately -7°C (19°F).

Further information on the Scott River watershed hydrology, geomorphology, and water quality is provided in Chapter 3.2 of this Draft EIR and reach-specific aquatic habitat conditions are described below under *Aquatic Habitat Conditions and Utilization* in this Chapter.

Special-Status Fish Species and CDFG Fish Species of Special Concern

Aquatic habitats within the Program Area are known to support one special-status species, coho salmon, and six CDFG species of special concern: Chinook salmon; steelhead; river lamprey; Klamath River lamprey; Pacific lamprey; and Miller Lake lamprey.⁴ The status, life cycle, habitat requirements, and known population trends of these species are described below with particular emphasis on coho salmon as they are listed as threatened under CESA and ESA and a primary objective of the Program is to conserve and protect coho salmon.

Coho Salmon

Status

Coho salmon in the Klamath River watershed are part of the federally-designated Southern Oregon/Northern California Coast (SONCC) Evolutionarily Significant Unit (ESU), which includes all coho salmon stocks between Cape Blanco in southern Oregon and Punta Gorda in northern California.

Based on its review of the status of coho salmon north of San Francisco, the California Department of Fish and Game (CDFG) (2002) concluded that California coho salmon have experienced a significant decline in the past 40 or 50 years. CDFG also concluded that coho salmon populations have been individually and cumulatively depleted or extirpated and that the natural linkages between individual populations have been fragmented or severed. For the California portion of the SONCC coho salmon ESU, an analysis of presence-by-brood-year data indicated that coho salmon now occupy about 61 percent of the streams that were previously identified by others (e.g., Brown and Moyle, 1991) as historical coho salmon streams (i.e., any stream for which published records of coho salmon presence could be found) (CDFG, 2002). However, these declines appeared to have occurred prior to the late 1980s and data available at the time of the CDFG (2002) analysis did not support a significant decline in distribution between the late 1980s and 2002. The analysis did indicate, however, that some streams in the ESU may

⁴ See footnote 3.

have lost one or more brood year⁵ lineages. Based on this information, CDFG concluded that coho salmon populations in the California portion of the SONCC ESU are threatened and will likely become endangered in the foreseeable future in the absence of special protection and management efforts required by CESA. In response to these findings, the California Fish and Game Commission (Commission) adopted amendments to § 670.5 in title 14 of the California Code of Regulations on August 5, 2004, adding California coho salmon populations between Punta Gorda and the northern border of California to the list of threatened species under CESA, effective as of March 30, 2005 (Commission, 2004). The Commission had adopted the *Recovery Strategy for California Coho Salmon* (CDFG, 2004a) the previous year.

The National Marine Fisheries Service (NMFS) conducted a similar status review of the SONCC coho salmon populations in 1995 (Weitkamp et al., 1995). NMFS arrived at similar conclusions as CDFG regarding the likelihood that coho salmon in this ESU may become endangered in the foreseeable future if observed declines continue. NMFS listed the ESU as threatened under ESA on May 6, 1997, and designated critical habitat⁶ for the ESU on May 5, 1999. The critical habitat designation encompasses accessible reaches of all streams and rivers within the range of SONCC coho salmon, including the Scott River. Two subsequent NMFS status reviews in 2001 and 2005 essentially reaffirmed the prior conclusions (NMFS, 2001a; NMFS, 2005a) and the ESU continues to be listed as threatened (NMFS, 2005b). NMFS recently completed a recovery plan for coho salmon in the Klamath River basin (NMFS, 2007) and is currently preparing a recovery plan for the entire SONCC ESU.

Life Cycle

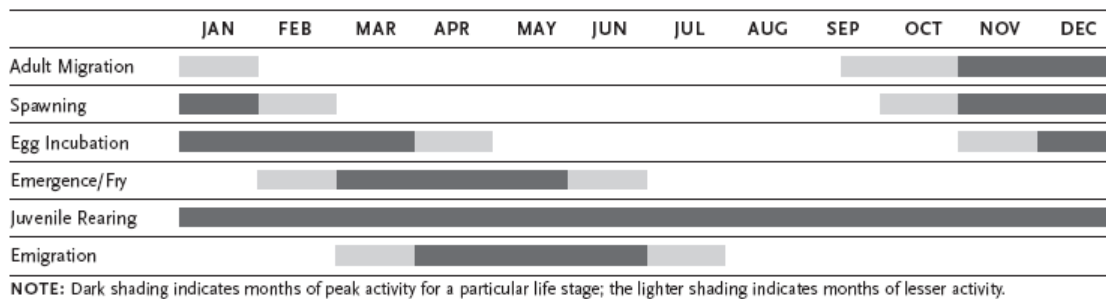
Adult coho salmon enter freshwater from the ocean in the fall in order to spawn. In the Klamath River watershed, coho salmon begin entering in early to mid-September and the migration reaches a peak in late September to early October. Arrival in the upper tributaries such as the Scott River generally peaks in November and December. The majority of the coho salmon spawning activity in this area occurs mainly during these two months. Females usually choose spawning sites near the head of a riffle, just below a pool, where the water changes from a smooth to a turbulent flow. Spawning sites are often located in areas with overhanging vegetation. Medium to small-sized gravel is essential for successful coho salmon spawning. Females dig nests, called “redds,” in the gravel and deposit approximately one hundred to several thousand eggs in each (CDFG, 2004a). After fertilization, the eggs are buried by the female digging another redd just upstream, which carries streambed materials a short distance downstream to the previous redd. The flow characteristics of the redd location usually ensure good aeration of eggs and embryos, and the flushing of waste products.

⁵ A brood year is identified by the year in which spawning begins. For example, offspring of coho that migrated up the Klamath River to spawn in the Scott River in the later part of 2001 or early part of 2002 are identified as “Brood Year 2001.”

⁶ The Endangered Species Act requires the federal government to designate “critical habitat” for any species it lists under the Act. “Critical habitat” is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

In California, coho salmon eggs generally incubate in the gravels from November through April. However, stream temperatures affect the timing of fry emergence and in the Program Area, incubation may extend into May. After hatching, the hatchlings, called “alevins,” remain within the gravel bed for two to 10 weeks before they emerge as fry into the actively flowing channel between February and June. The fry seek out shallow, low velocity water, usually moving to the stream margins, where they form schools. As the fish feed heavily and grow, the schools generally break up and individual fish set up territories. At this stage, the juvenile fish are called “parr”. As the parr continue to grow and expand their territories, they move progressively into deeper water until July and August, when they inhabit the deepest pools. Rearing areas used by juvenile coho salmon include low-gradient coastal streams, lakes, sloughs, side channels, estuaries, low-gradient tributaries to large rivers, beaver ponds, and large slackwaters. The most productive juvenile habitats are found in smaller streams with low-gradient alluvial channels, containing abundant pools formed by LWD such as fallen trees.

Juvenile coho salmon typically rear in freshwater for an entire year before ocean entry (see **Figure 3.3-2**). This necessitates survival of juvenile coho salmon in streams through the winter months. Inland winter streamflows are characterized by periods of cold low flows interspersed with freshets and possibly floods. Juvenile coho salmon require areas of velocity refuge during periods of high flows. Potential habitats offering velocity refuge during winter include off-channel habitats and beaver ponds.



SOURCE: CDFG, 2004a

Figure 3.3-2
Seasonal Presence of Coho Salmon Life Cycle Stages
in California Coastal Watersheds

After spending one year in fresh water, the majority of the juvenile coho salmon hatched during the previous spring begin migrating downstream to the ocean in late March/early April through June. Juvenile salmonids migrating toward the ocean are called “smolts.” Upon entry into the ocean, the immature salmon remain in inshore waters, congregating in schools as they move north along the continental shelf. After two years of growing and sexually maturing in the ocean, coho salmon return to their natal streams as three-year-olds to begin the life cycle again.

This three-year cycle is fairly rigid among coho salmon as they rarely spend less than two years in the ocean.⁷ Since all wild female coho salmon are typically three years old when spawning, there are three distinct and separate maternal brood year lineages for each stream. For example, almost all coho salmon produced in 1994 were progeny of females produced three years earlier in 1991, which in turn were progeny of females produced three years earlier in 1988, and so on. The three maternal brood year lineages are:

Brood Year Lineage I:1994....1997....2000....2003....2006....
Brood Year Lineage II:1995....1998....2001....2004....2007....
Brood Year Lineage III:1996....1999....2002....2005....2008....

This life cycle has been cited as a major reason for coho salmon's greater vulnerability to catastrophic events compared to other salmonids (CDFG, 1998). Should a major event, such as El Niño floods or anthropogenic disturbance severely deplete coho salmon stocks during one year, the effects will be noticed three years later when few or no surviving female coho salmon return to continue the brood year lineage.

Habitat Requirements

Suitable aquatic habitat conditions are essential for migrating, spawning, and rearing coho salmon. Important components of productive freshwater habitat for coho salmon include a healthy riparian corridor, presence of LWD in the channel, appropriate substrate type and size, a relatively unimpaired hydrologic regime, low summer water temperatures, and relatively high dissolved oxygen concentrations. The importance of these habitat parameters is further described below, based on a summary provided in CDFG (2004a).

Riparian vegetation provides many essential benefits to stream conditions and habitat. It serves as a buffer from sediment and pollution, influences the geomorphology and streamflow, and provides streambank stability. The riparian buffer is vital to moderating water temperatures that influence spawning and rearing by providing the canopy, which protects the water from direct solar heating, and the buffer, which provides a cooler microclimate and lower ambient temperatures near the stream. The riparian canopy also serves as cover from predators, and supplies both insect prey and organic nutrients to streams, and is a source for LWD.

LWD within the stream channel is an essential component of coho salmon habitat with several ecological functions. It stabilizes substrate, provides cover from predators and shelter from high water velocities, aids in pool and spawning bed establishment and maintenance, and provides habitat for aquatic invertebrate prey.

The channel substrate type and size, and the quantity and distribution of sediment, have essential direct and indirect functions at several life stages of coho salmon. Adults require gravel of appropriate size and shape for spawning (building redds and laying/fertilizing the eggs). Eggs develop and hatch within the substrate, and alevins remain there for some time for protection and shelter. An excess of fine sediment such as sandy and/or silty materials is a significant threat to

⁷ Some coho return to spawn after spending only one year in the ocean. These fish are referred to as grilse or jacks.

eggs and fry because it can reduce the interstitial flow necessary to regulate water temperature and dissolved oxygen, remove excreted waste, and provide food for fry. Fine sediments may also envelop and suffocate eggs and fry, and reduce available fry habitat. The substrate also functions as habitat for rearing juveniles by providing shelter from faster flowing water and protection from predators. Furthermore, some invertebrate prey inhabit the benthic environment of the stream substrate.

The characteristics of the water and geomorphology of the stream channel are fundamentally essential to all coho salmon life stages. Important characteristics include water velocity, flow volume, water depths, and the seasonal changes and dynamics of each of these (e.g., summer flow, peak flow, and winter freshets). Appropriate water temperature regimes, in particular, are essential throughout the freshwater phases of the coho salmon life cycle. Water temperature affects the rate and success of egg development; fry maturation; juvenile growth, distribution, and survival; smoltification; initiation of adult migration; and survival and success of spawning adults. Water temperature is influenced by many factors including streamflow, riparian vegetation, channel morphology, hydrology, soil-geomorphology interaction, climate, and impacts of human activities. The heat energy contained within the water and the ecological paths through which heat enters and leaves the water are dynamic and complex.

As a general guideline, the appropriate water temperature range for coho salmon is approximately 3-20°C (37-68°F) (Hardy and Addley, 2001), although preferred rearing temperatures are 12-14°C (54-57°F) (Bjornn and Reiser, 1991). Temperatures above 16.5°C (61.7°F) have been documented to result in a 10 percent weight decrease in juvenile coho salmon (Sullivan et al., 2000) and upper lethal temperatures have been reported as 26°C (79°F) (Bjornn and Reiser, 1991; Sullivan et al., 2000). However, water temperature requirements must be considered in relation to the unique physiological phenomena associated with each life stage. Additionally, environmental conditions in specific watersheds may affect the normal range and extreme end-points for any of these temperature conditions for coho salmon within these watersheds. The water temperature requirements for coho salmon are dependent on their metabolism and health, and on available food. These factors need to be considered together when trying to understand the habitat needs of coho salmon in a particular watershed or river system.

An adequate level of dissolved oxygen is necessary for each life stage of coho salmon and is affected by water temperature, instream primary productivity, and streamflow. Fine sediment concentrations in gravel beds can also affect dissolved oxygen levels, impacting eggs and fry. Dissolved oxygen levels in streams and rivers are typically lowest during the summer and early fall, when water temperatures are higher and streamflows lower than during the rest of the year. Dissolved oxygen concentrations of eight mg/L or higher are typically considered ideal for rearing salmonids including coho salmon. Rearing juveniles may be able to survive when concentrations are relatively low (e.g., less than five mg/L), but growth, metabolism, and swimming performance are adversely affected (Bjornn and Reiser, 1991).

Population Trends

According to information cited by the Shasta-Scott Coho Recovery Team (2003), the Scott River sub-basin probably holds the largest number of native coho salmon of the larger Klamath River

tributaries. However, only very limited historic information exists on numbers of returning spawners prior to 1982. CDFG estimated the coho salmon population of the Scott River watershed during the early 1960s at 800 (SSRT, 2003).

Between 1982 and 1991, CDFG operated a weir in the Scott River near its confluence with the Klamath River. The primary purpose of the weir was to facilitate development of fall Chinook escapement estimates using mark and recapture methods, and the weir was removed each year prior to the height of the coho salmon migration and spawning period. Thus, only early returning coho salmon were counted while the weir was operating. As a result, the coho salmon counts presented in **Table 3.3-1** should not be understood to represent total run size.

TABLE 3.3-1
YEAR, DATES OF OPERATION, AND COUNTS OF EARLY RETURNING COHO SALMON OBSERVED
AT THE SCOTT RIVER WEIR OPERATED BY CDFG

Year	Dates of Operation	Grilse	Adults	Total
1982	9/14 to 10/29	0	5	5
1983	9/14 to 11/3	1	21	22
1984	9/10 to 10/31	12	38	50
1985	9/3 to 11/12	0	1	1
1986	9/11 to 11/19	18	49	67
1987	9/25 to 11/18	12	248	260
1988	9/24 to 11/9		No coho reported	
1989	9/8 to 10/22	1	7	8
1990	9/8 to 10/28	1	6	7
1991	9/10 to 11/5	0	3	3

SOURCE: SSRT (2003)

During the 2007-2008 coho salmon spawning season, CDFG operated a video weir at RM 19.8 to monitor the adult coho salmon run in the Scott River. The weir was operated from October 29 through January 3 with only three non-operational days. Although the results of the study have not been finalized, preliminary results available indicate that a total of 1,342 adult coho salmon migrated upstream during the monitoring period (Knechtle, 2008). CDFG hopes to continue the adult return counts in the future.

The current known and suspected spatial distribution of coho salmon in the Program Area is depicted in **Figure 3.3-3**. Formal coho salmon spawning ground surveys of redds and carcasses were initiated in the Program Area with the 2001-2002 spawning season and have been conducted each year since (e.g., Quigley, 2006a; 2007; Yokel, 2008). The results of the yearly surveys are not directly comparable to later surveys due to differences in survey locations, extent, and conditions. However, standardizing the results to redds observed only in reaches surveyed in 2001-2002 does provide an indication of overall coho salmon population trends within the Program Area. The total and standardized results of the surveys are presented in **Table 3.3-2**.

TABLE 3.3-2
SCOTT RIVER WATERSHED COHO SPAWNER SURVEY RESULTS OF REDD AND
CARCASS COUNTS FOR THE 2001-2002 THROUGH 2007-2008 SPAWNING SEASONS

	2001–2002	2002–2003	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008
Redds	206	17	7	960	24	7	259
Carcasses	115	2	7	569	14	6	130
Redds in Reaches Surveyed in 2001-2002	206	5	4	458	30	12	127

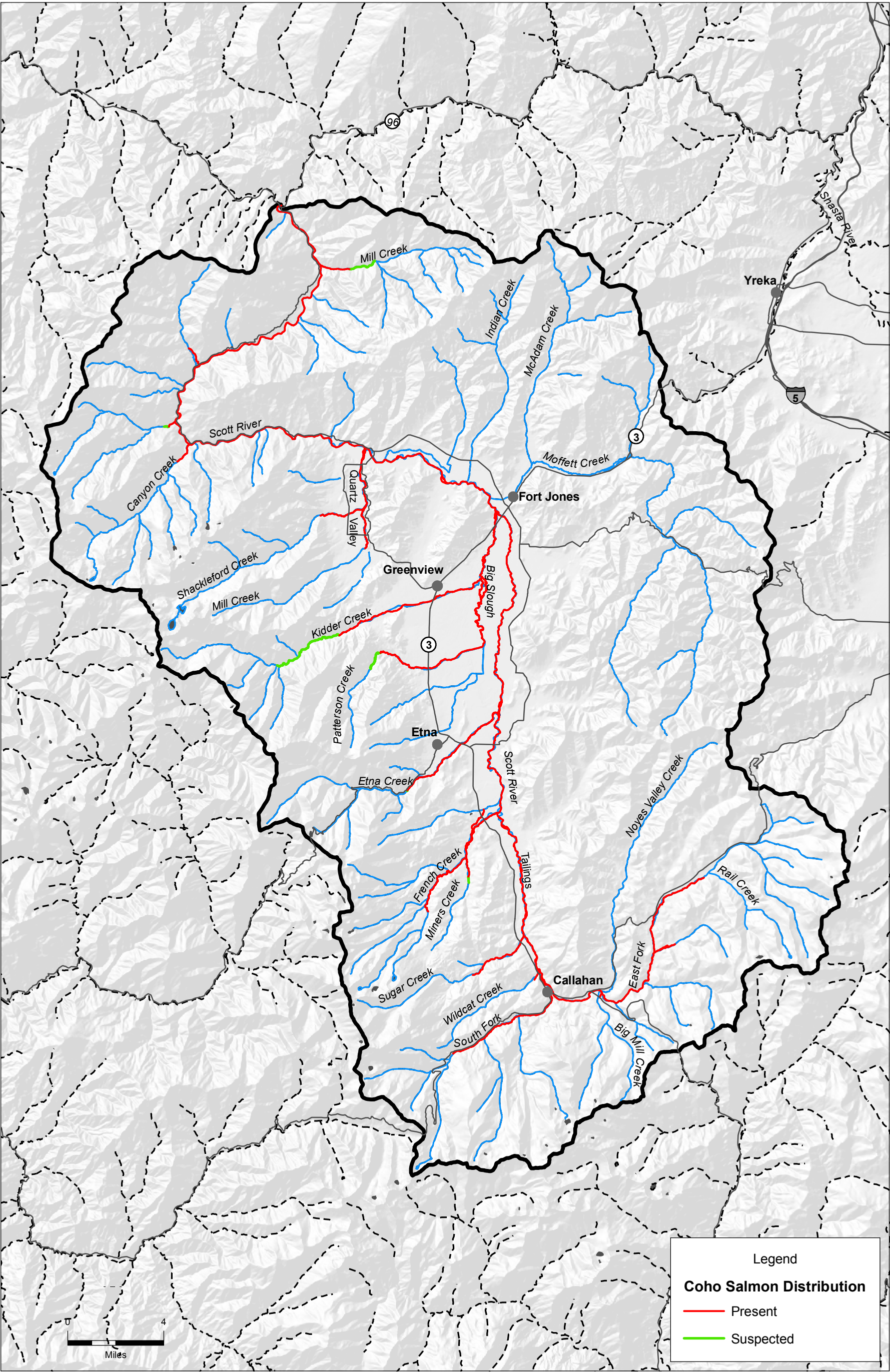
SOURCE: SQRCD, 2005; Quigley, 2006b; 2007; Yokel, 2008.

Notwithstanding the inability to make definitive year-to-year comparisons for total escapement due to the increasing scope of the surveys over the past seven years, an examination of the standardized data presented in Table 3.3-2 does allow for an assessment of the trend of the number of spawners. The results appear to support the theory that only one relatively strong brood year lineage (2001...2004....2007) remains within the Scott River watershed and that adult returns even among that lineage may fluctuate widely. To provide perspective, it should be noted that across the range of coho salmon along the California coast, an average decline of 73 percent in returning adults occurred in 2007 compared to the same cohort in 2004 (McFarlane et al., 2008).

Yearly monitoring of juvenile salmonids, including coho salmon, was initiated on several reaches of the French Creek sub-basin in 1992 (CDFG, 2006). French Creek is a western tributary to the Scott River in the southwestern portion of the watershed. The surveys were conducted every year from 1992 through 2005 (except 1998) within the same five reaches with only some minor exceptions (CDFG, 2006). **Figure 3.3-4** depicts the yearly relative abundance of juvenile coho salmon derived from this study. The juvenile monitoring data appear to show the same trends as the spawner surveys discussed above with the same relatively strong brood lineage and two very depressed brood lineages (note that juveniles surveyed in a given year are offspring of the previous brood year).

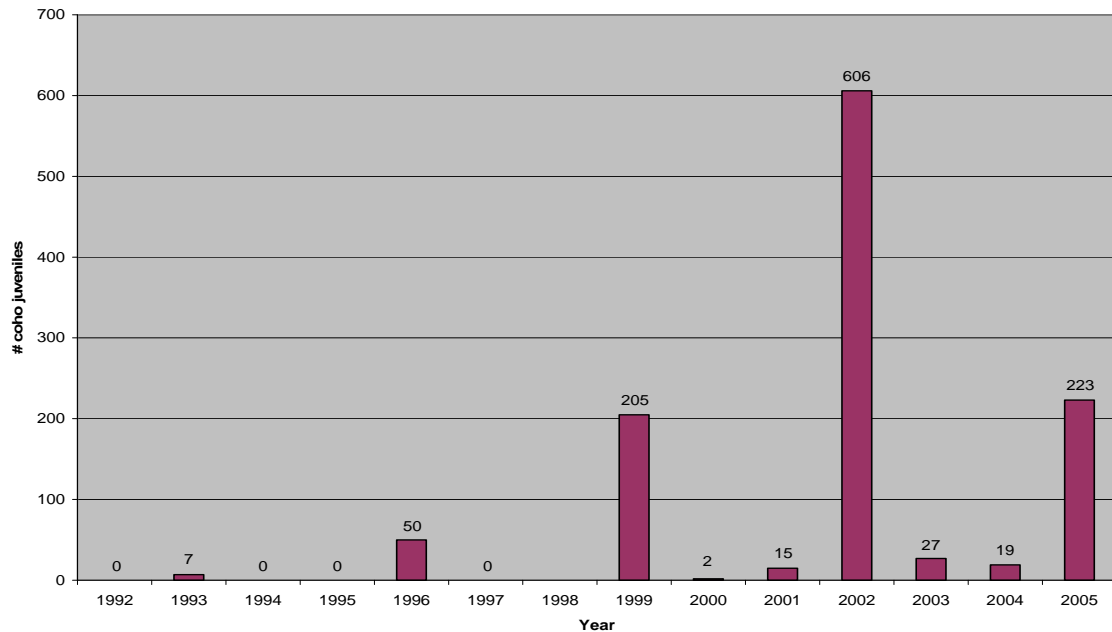
In addition to spawner surveys and juvenile monitoring in French Creek, CDFG began conducting annual rotary screw trap surveys on the Scott River to monitor outmigrant salmonid juveniles, including coho salmon, in 2003 (Chesney et al., 2007; Chesney, 2008). Population estimates were derived using a mark and recapture method but the low numbers of recaptures during some years (2003 and 2004) and the intentional avoidance of the recapture method to protect the anticipated low numbers of juveniles (2007) did not allow for population estimates. The results of the surveys are summarized in **Table 3.3-3**.

Based on the results of the outmigrant trapping surveys, the 2001-2004 brood lineage appears to be the strongest, as evidenced by the high number of age 1+ fish in 2003 (2001 brood), age 0+ fish in 2005 (2004 brood) and age 1+ fish in 2006 (2004 brood). Although the outmigrant trapping surveys have not been conducted for a long enough period to discern any definitive population trends, the results appear to be consistent with those observed during the surveys for rearing juveniles on French Creek described above.



SOURCE: ESA, 2007

Scott River Watershed-Wide Permitting Program . 206063
Figure 3.3-3
Coho Salmon Distribution within the Scott River Watershed



SOURCE: CDFG, 2006

Figure 3.3-4
Relative Abundances of Juvenile Coho Salmon
in French Creek, 1992-2005

TABLE 3.3-3
YEARLY SCOTT RIVER WATERSHED COHO POPULATION ESTIMATES
BASED ON OUTMIGRANT TRAPPING SURVEYS

	2003	2004	2005	2006	2007
Age 0+ coho	282	58	80,498	1,772	1,613
Age 1+ coho	34,149	93	1,160	75,097	352

^a NOTE: Due to low number of age 0+ recaptures during the 2003 and 2004 seasons, and low numbers of recaptures of 1+ in 2004, population estimates were not possible and the numbers presented are total counts of fish captured.

^b NOTE: Due to anticipated low numbers of age 1+ coho salmon in 2007, mark/recapture methods to estimate trap efficiency were not used in 2007; instead, efficiency was estimated based on a correlation between trap efficiency data for age 2+ steelhead in 2007 and age 1+ coho salmon in 2004 and 2005.

SOURCE: Chesney et al., 2007; Chesney, 2007; Chesney, 2008.

The observed phenomenon of large numbers of coho salmon leaving the Scott River as young-of-the-year (age 0+) is somewhat unusual for the species. The reasons for this premature exit from the watershed is not fully understood, but appears to be correlated to the yearly loss of rearing habitat associated with decreased streamflows and increased water temperatures (Chesney, 2007). Flows during the spring in the Scott River mainstem and tributaries decrease rapidly once the snow pack has melted and the irrigation season begins.

SQRCD also conducted an outmigrant trapping study of juvenile coho salmon on several tributaries of the Scott River during the period of October 2005 through June 2006 (Yokel, 2006). This study extended over only one fall/winter/spring season and therefore does not provide an indication of coho salmon population trends. However, results of the study indicate that some juvenile coho salmon migrate out of the tributary streams and into the mainstem of the Scott River in response to high winter flows (Yokel, 2006). These observations are consistent with numerous studies (e.g., Bell, 2001; Bell et al., 2001; Peterson, 1982) that have shown that coho salmon seek low velocity habitats during high flow events.

Chinook Salmon

Status

Chinook salmon in the Scott River watershed are part of the federally-designated Upper Klamath and Trinity Rivers Chinook ESU, which includes all populations upstream of the confluence of these two rivers. NMFS determined on March 9, 1998 that this ESU did not warrant listing under the federal ESA. Spring-run Chinook salmon within this ESU are a CDFG species of special concern.

Life Cycle

The life history patterns of Chinook salmon vary among runs. The Klamath River Basin, including the Scott River, currently supports fall-run and historically supported spring-run Chinook salmon. A third run, the late fall-run, may also have historically existed in the basin, but it is either poorly documented or extinct (Moyle, 2002). The spring-run differs from the fall-run in that the adults enter the river before they are ready to spawn and reside in deep pools for two to four months before they spawn, whereas fall-run adults spawn soon after reaching their spawning destination (Moyle, 2002). In addition, spring-run juveniles may remain in the streams for a year or longer before their seaward migration, whereas fall-run juveniles are generally less than one year old before they migrate to sea.

Adult fall-run Chinook salmon entry into the Klamath River Basin typically peaks in September and continues through late October, with adults arriving at their spawning grounds approximately two to four weeks after freshwater entry (NRC, 2004). As such, adult Chinook salmon typically arrive in the Scott River watershed prior to the peak of coho salmon spawning migration. Chinook salmon tend to spawn in lower gradient reaches than coho salmon, primarily in rivers and larger streams. The timing and distribution of fall-run Chinook salmon spawning within the Scott River watershed has been documented annually during cooperative spawning ground surveys since 1992. Fall Chinook salmon primarily utilize the mainstem Scott River from its confluence with the Klamath River to approximately Faye Lane. Spawning distribution within the mainstem can be limited during periods of low flow as fish are unable to leave the Scott Canyon reach and ascend into the valley areas due to a lack of streamflow (SRWC, 2005). The majority of juvenile fall-run Chinook salmon spend only a few months rearing in freshwater before outmigrating in the spring and early summer. Peak smolt outmigration from the Scott River typically occurs in April through June (SRWC, 2005).

Spring-run Chinook salmon enter rivers as immature fish in spring and early summer. They migrate to their upstream spawning sites where they hold for several months in deep, cool pools prior to spawning in early fall. Juvenile spring-run Chinook salmon rear in freshwater for three to fifteen months with outmigration peaking in winter (January – February) and again in spring (April) (Moyle, 2002).

Habitat Requirements

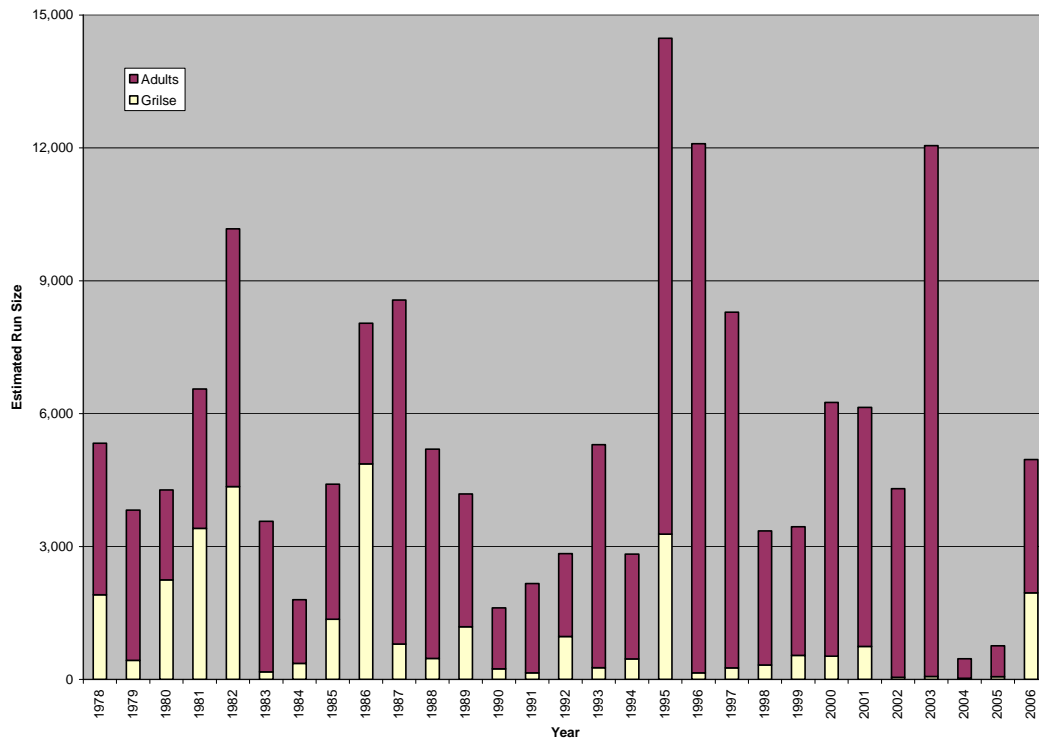
Although the life history patterns of Chinook salmon differ from that of coho salmon, the overall habitat requirements of the two species are fairly similar. Like coho salmon, Chinook salmon require adequate flows, temperatures, water depths and velocities, appropriate spawning and rearing substrates, and availability of instream cover and food. The importance of these habitat parameters are described above for coho salmon.

Adult holding areas, consisting of deep pools with cool water temperatures, are of particular importance to spring-run Chinook which must reside in the freshwater streams and rivers throughout the summer. Adult fall-run Chinook salmon, on the other hand, are particularly dependent on adequate streamflows in the fall, prior to the onset of significant precipitation, to enable successful migration to their spawning sites. Most juvenile Chinook salmon leave their freshwater habitat in the spring and are therefore not as susceptible to the high water temperatures and low streamflows that are common during summer and early fall. The optimal rearing temperature range for juvenile Chinook salmon is approximately 14 to 19°C (57-66°F) (Hardey and Addley, 2001), which is somewhat higher than that of coho salmon. The upper lethal temperature for Chinook salmon, however, is similar to that of coho salmon which has been reported as 26°C (79°F) (Bjornn and Reiser, 1991).

Population Trends

No estimates of Chinook salmon population prior to the 1950s are available for the Scott River watershed. In the early 1960s, fall-run Chinook salmon run sizes in the Scott River were estimated at 8,000 to 10,000 (SRWC, 2005). Fall-run Chinook salmon escapement estimates for the Scott River watershed have been made annually since 1978 (**Figure 3.3-5**). Between 1978 and 2006, fall-run Chinook salmon returns averaged 4,335 adults per year with a high of 11,988 in 2003 and a low of 445 the following year (CDFG, 2007).

Spring-run Chinook salmon, once the most abundant Chinook run in the Klamath River basin (Hardy and Addley, 2001), were reportedly present in the Scott River until at least the early 1960's (West, 1991); a remnant population of this run is thought to be confined to the Salmon River watershed (Chesney, 2006). However, in October 2006, CDFG personnel operating a screw trap on the mainstem Shasta River noted that some juvenile male Chinook salmon caught in the trap were sexually mature (Jeffres et al., 2008). Mature male juveniles are very rare in nature and are most often found in spring-run Chinook salmon that hatch earlier than fall-run fish, and thus are able to grow more rapidly and mature at an earlier age (Jeffres et al., 2008). While the potential exists for these early maturing juveniles to be offspring of a vestigial run of spring Chinook salmon in the Shasta River, they may also be the product of early spawning fall-run



SOURCE: CDFG, 2007

Figure 3.3-5
 Scott River Fall-Run Chinook Salmon
 Run-Size Estimates, 1978-2006

Chinook salmon utilizing spawning gravels in the vicinity of Big Springs Creek in the Shasta River watershed. As this area is influenced by warmer spring flows naturally rich in nutrients, the incubation period is likely reduced and the resultant fry emerge earlier to experience a longer growing period in a highly productive environment. This could also lead to early sexual maturation and precocious behavior. Additional evaluation is needed. Similar mature juveniles have not been observed in the Scott River watershed.

Steelhead

Status

Steelhead within the Scott River basin are part of the federally-designated the Klamath Mountains Province Distinct Population Segment (DPS). Listing of this DPS under ESA was determined not to be warranted by NMFS on April 4, 2001. Summer-run steelhead within this DPS are a CDFG species of special concern.

Life Cycle

Steelhead exhibit one of the most complex life histories of any salmonid species. The resident rainbow trout form spends its entire life in freshwater environments, while the anadromous steelhead form migrates between its natal streams and the ocean. Furthermore, two reproductive

forms of steelhead are recognized, the summer-run (stream-maturing) and winter-run (ocean-maturing), which describes the level of sexual development following return to the freshwater environment. Some researchers further divide the winter steelhead into early (fall-run) and late (winter-run) (e.g., Hardy and Addley, 2001), but the two forms have similar life histories (NRC, 2004) and are treated together here as winter-run steelhead. In addition, the Klamath River Basin is distinctive in that it is one of the few basins producing “half-pounder” steelhead. This life history type refers to immature steelhead that return to fresh water after only two to four months in the ocean, generally over-winter in fresh water, then outmigrate again the following spring (NMFS, 2001b).

Unlike salmon, steelhead are iteroparous, meaning they can spawn more than once before they die. In California, females commonly spawn twice before they die. Adult winter-run steelhead typically enter the Klamath River from late August to February before spawning, which extends from January through April, peaking in February and March (NRC, 2004). Summer-run steelhead enter freshwater as immature fish from May to July, migrate upstream to the cool waters of larger tributaries, and hold in deep pools roughly until December, when they spawn (NRC, 2004). Juvenile steelhead rear in freshwater for one to three years (mostly two) before migrating downstream toward the ocean in spring, primarily during the months of March through May. They then typically reside in marine waters one to three years prior to returning to their natal stream to spawn as three- or four-year olds.

Habitat Requirements

As discussed above, the overall habitat requirements of the various salmonid species are fairly similar. Like coho salmon, steelhead require adequate flows, temperatures, water depths and velocities, appropriate spawning and rearing substrates, and availability of instream cover and food. The importance of these habitat parameters are described above for coho salmon.

Notable differences in habitat preferences include the fact that while juvenile coho salmon prefer pools with low average velocities and are not as common in riffles with high current velocities, juvenile steelhead tend to occupy riffles, as well as deep pools with relatively high velocities along the center of the channel (Bisson et al., 1988). Similar to spring-run Chinook salmon, adult holding areas are of particular importance to summer-run steelhead who must reside in the freshwater streams and rivers throughout the summer. The thermal tolerance of steelhead is generally higher than that of most other salmonids. Preferred temperatures in the field are usually 15 to 18°C (59-64°F), but juveniles regularly persist in water where daytime temperatures reach 26 to 27°C (79-81°F) (Moyle, 2002). Long-term exposure to temperatures continuously above 24°C, however, is usually lethal (NRC, 2004; Moyle, 2002).

Population Trends

Population trends of steelhead within the Program Area have not been monitored as closely as those of coho and Chinook salmon. Within the Klamath Basin, historical numbers of winter steelhead are not known, but total run sizes in the 1960s were estimated at about 170,000 for the Klamath River and 50,000 for the Trinity River (NRC, 2004). In the 1970s, Klamath River runs were estimated to average around 129,000 and by the 1980s, they had dropped to around 100,000

(NRC, 2004). In 2001, NMFS estimated the natural escapement for the entire Klamath Mountains Province DPS at 100,000 to 130,000 adults per year, with the California portion of the DPS contributing approximately 30,000 to 50,000 adults (NMFS, 2001b).

Summer-run steelhead once were widely distributed in the Klamath Basin and were present in most headwaters of the larger tributaries (NRC, 2004). In the 1990s, estimated numbers were 1,000 to 1,500 adults across eight populations – less than 10 percent of their former abundance (Moyle, 2002). Numbers presumably are still declining because of loss of habitat, poaching in summer, and reduced access to upstream areas during migration periods as a result of diversions (NRC, 2004). Summer-run steelhead are largely extirpated from the Scott River sub-basin, although small numbers of them may be found occasionally during different water years in a few locations in the Scott River system (USFS, 2000).

Lampreys

Status

Four lamprey species have been observed in the Scott River watershed: river lamprey; Klamath River lamprey; Pacific lamprey; and Miller Lake lamprey (Chesney et al., 2007). The river and Klamath River lampreys are CDFG fish species of special concern. The U.S. Fish and Wildlife Service (USFWS) determined in 2004 that a formal listing of the Pacific lamprey under ESA was not warranted (USFWS, 2004). However, there is reasonable likelihood that the Pacific lamprey may become listed in the foreseeable future and they are also considered a tribal trust species with a high priority for recovery to fishable populations (NRC, 2004). Therefore, Pacific lampreys are treated as a CDFG fish species of special concern for the purposes of this Draft EIR.

The Miller Lake lamprey was thought to have been extinct since 1958 as a result of a deliberate chemical treatment of Miller Lake (the only known location at the time). However, since 1992, the species has been observed in the Williamson River and Miller Creek. Subsequent surveys in the summers of 1997 - 1999 reconfirmed the species extinction in Miller Lake but lead to the discovery of several subpopulations of *L. minima* within and outside the Miller Lake sub-basin (Hilton-Taylor, 2007). The 2006 discovery of the species in the Scott River (Chesney et al., 2007) presumably further extended its known distribution range. The Miller Lake lamprey currently has no official listing status and the International Union for Conservation of Nature (IUCN) currently lists the species as “data deficient” (Hilton-Taylor, 2004). However, due to their apparently limited distribution and abundance, Miller Lake lampreys are treated as a CDFG fish species of special concern for the purposes of this Draft EIR.

Life History

Lampreys are anadromous. Like salmon and steelhead, they hatch in freshwater streams, migrate out to the ocean, and return to fresh water as mature adults to spawn. Landlocked forms that do not migrate to the ocean are also known, including from the Upper Klamath Basin (Moyle, 2002). The life history of the Klamath River lamprey has not been documented and the biology of river lampreys has only been studied in British Columbia where the timing of life history events may or may not be the same as in California (Moyle, 2002). Thus, the following description focuses largely on Pacific lampreys.

Most adult Pacific lampreys enter freshwater from January through March to spawn from March to June, although movement has also been observed in most other months (Moyle, 2002). Most spawning appears to take place in the mainstem or larger tributaries. Like salmon, lampreys construct redds for spawning in gravel riffles. Once they emerge, larvae (ammocoetes) are carried downstream by streamflows and burrow into sand or mud substrates at the edge of the river. The larvae live in burrows for probably five to seven years, during which time they move about frequently and are commonly captured in salmon outmigrant traps (NRC, 2004). Once the ammocoetes transform into adults, they migrate to the sea. Downstream migration usually is coincidental with high flows in the spring, but movement has also been observed during summer and fall (NRC, 2004). In the ocean and estuary, they prey on salmonids and other fish for one to two years before returning to spawn.

Habitat Requirements

While in freshwater, lampreys are often found to coexist with steelhead and salmon, indicating that these species share similar habitat requirements. Juveniles require muddy bottoms, backwater areas, and low gradient areas, and it is therefore likely that rapid or frequent drops in flow deprive them of habitat and force them to move into open water, where they are vulnerable to predation (NRC, 2004). Due to the migratory behavior of the species, lamprey distribution within watersheds is also affected by barriers. They do not, however, appear to be limited by water temperatures (NRC, 2004).

Population Trends

Lampreys once were so abundant in the coastal rivers of California that they inspired the name Eel River for the third largest river in the state (NRC, 2004). Today, their numbers are low and declining (NRC, 2004; Moyle, 2002).

Other Fisheries Resources

In addition to coho salmon and the CDFG species of special concern described above, the Program Area supports other native, non-listed fish species such Klamath smallscale sucker (*Catostomus rimiculus*), speckled dace (*Rhinichthys osculus*), and marbled sculpin (*Cottus klamathensis*) (Chesney et al., 2007). Although the life cycles and habitat requirements of these species may differ somewhat from those of coho salmon and CDFG fish species of special concern, all native fisheries within the Scott River have co-evolved and are similarly affected by aquatic habitat disturbances. Furthermore, populations of these species have received little attention and population trends are not available. Thus, due to their non-special status, similar preference for undisturbed aquatic habitat conditions, and lack of adequate population data, these species are not further discussed in this Draft EIR.

A number of non-native fish species are also known to be present in the Scott River watershed. The most abundant of these appear to be brook stickleback (*Culaea inconstans*) and fathead minnow (*Pimephales promelas*), while species such as green sunfish (*Lepomis cyanellus*), golden shiner (*Notemigonus crysoleucas*), and largemouth bass (*Micropterus salmoides*) appear to be rare (Chesney et al., 2007). To the extent the Program will adversely affect non-native fish

species (e.g., direct mortality resulting from instream construction activities, potential decreases in habitat suitability resulting from decreases in water temperatures), the impacts will be less than significant because when present in streams or rivers, non-native fish species typically compete with, or prey on, native species, and therefore any reduction in non-native fish species will benefit native fish. In that regard, any reduction in the abundance or distribution of non-native fish species will only serve to further one of the primary the objectives of the Program to protect and preserve coho salmon. Thus, non-native fish species are not further discussed in this Draft EIR.

Aquatic Habitat Conditions and Utilization

This section describes the existing aquatic habitat conditions and utilization by coho salmon and CDFG fish species of special concern within the Scott River watershed, with primary attention given to coho salmon and other salmonids. For clarity, the watershed has been divided into various sub-watershed areas based on similarities in geomorphologic and biologic conditions. Due to the large geographic scope of the Program Area, aquatic habitat conditions are described on the sub-watershed scale (e.g., adequate spawning habitat and poor rearing habitat) rather than detailed reach-by-reach accounts of existing habitat features (e.g., pool complexity and percent cover). Such detailed descriptions can be found in Quigley (2006c) and available CDFG *Stream Inventory Reports*, which are included by reference. The descriptions of the sub-watersheds are largely based on summaries provided by SQRCD (2005). Figure 3.3-1 depicts the Scott River watershed, including significant tributary streams.

East Fork Scott River

The East and South Fork of the Scott River meet at the town of Callahan and form the headwaters of the Scott River mainstem. The East Fork drains the Scott Mountains flowing in a southwesterly direction. Elevations of this drainage range from 3,120 feet at Callahan to 8,540 feet at China Mountain. The East Fork drains a total of 72,650 acres, equivalent to 14 percent of the total Program Area. The headwater tributaries in this sub-basin are generally small, steep, high gradient streams. These high gradient streams flow into alluvial channels of low gradient, moderately confined valley bottoms. These low gradient valley channels are bordered by discontinuous alluvial floodplains. Land use consists of a mix of federal and commercial forestland, rangeland and irrigated agricultural land.

Agricultural activity in the East Fork includes mountain range grazing in the summer and fall, and pasture production in the alluvial valleys. Areas under pasture production are next to the streams and riparian fencing/riparian protection is minimal. Nearly all irrigated pasture is flood irrigated from the East Fork and its tributaries. Livestock are watered through surface water diversions as well. The primary method used to divert water from the stream and into irrigation ditches is the construction of seasonal gravel push-up dams and hand stacked rock and cobble diversion structures. Water diversions on the East Fork Scott River are permitted to occur during the irrigation season, defined as April 1 through October 15 in the Scott River Decree (No. 30662, 1980). Stock water diversion is permitted throughout the year.

An estimated maximum of 76 cubic feet per second (cfs) are diverted from 16 active diversions in the East Fork system in the spring. By the early fall, as flows throughout the watershed decrease, the volume of water that is actually diverted is typically less than 10 cfs. Stock water diversion volume is less than 5 cfs. Diversions occur on the East Fork and all its tributaries except Mule Creek. Thirteen of the 16 active diversions are known or presumed to be located within reaches utilized by coho salmon and have been screened with fish screens meeting CDFG/NMFS standards (D. Yokel, 2006). The other three active diversions are located upstream of the currently known range of coho salmon and are not screened.

Riparian conditions in the East Fork sub-watershed are generally poor, particularly along the mainstem East Fork. Riparian areas are usually not contiguous and are limited to single rows of trees, with many being mature to decadent. Grazing and the presence of levees have prevented riparian regeneration.⁸ Furthermore, the use of levees has limited channel access to the floodplain and has resulted in channel down-cutting, which in turn has lowered the creek bed to levels where the roots of existing riparian trees may no longer obtain water during low flow periods.

Although generally in poor condition, the presence of certain components of the riparian zone, such as adequate seed stocks, suggest that improvements may be possible in many areas. A small fencing/planting project near lower Masterson Road in 2000-2001 improved conditions for both planted riparian species and native propagation when channel manipulation and grazing was limited. As of March 2005, riparian planting and fencing efforts had only been conducted on less than 5,000 feet of channels within the East Fork sub-watershed.

Summer stream temperature data have been collected by SQRCD in the East Fork, Rail Creek, and Kangaroo Creek annually since 1996 and at various sites by the NCRWQCB (2005). Data collected during May through October indicate Maximum Weekly Average Temperature (MWAT) values of 19-23°C (66-73°F) in the East Fork and 12-18°C (54-64°F) in Rail and Kangaroo Creeks. It should be noted that maximum temperatures are typically recorded in the late afternoon and the stream water may cool by 2-6°C during the course of the night (Quigley et al., 2001). Stream flow data collected by the United States Geological Survey (USGS) on the East Fork just below the town of Callahan (1960 to 1974) and by the California Department of Water Resources (DWR) show the average August and September flows to be 5 and 3 cfs, respectively.

Coho salmon and steelhead are currently known to use the East Fork watershed. Only one coho salmon brood year lineage (2001...2004) was previously presumed to utilize the East Fork for spawning, but one redd was observed near the town of Callahan in 2005 (Quigley, 2006a). The range of coho salmon use within the East Fork is unknown. Based on stream gradient and existing

⁸ As discussed in Chapter 3.2, livestock grazing is a Covered Activity under the Program, but similar to some other Covered Activities it is not new; rather, it has been occurring in the Program Area for decades. Hence, authorizing livestock grazing as part of the Program will not cause the level of grazing to increase or result in any impacts in addition to those that are already part of baseline conditions in the Program Area. In fact, the Program will reduce the impacts of grazing by excluding livestock from some riparian areas by installing and maintaining fencing (see ITP and MLTC Covered Activity 5). Also, where riparian fencing is constructed as part of the Program, any grazing of livestock adjacent to the channel or within the bed, bank, or channel of the Shasta River or its tributaries may only occur in accordance with a grazing management plan that will result in improved riparian function and enhanced aquatic habitat.

migration barriers, coho salmon could potentially access up to 10 miles of the East Fork, two miles of Kangaroo Creek, several hundred yards of Mule Creek, four miles of Noyes Valley Creek, several hundred yards of Big Mill Creek (i.e., below the current Highway 3 migration barrier), several hundred yards of Rail Creek (irrigation pond barrier), half a mile of Houston Creek, and 0.8 mile of Grouse Creek. Coho salmon have been observed as high as 0.3 mile on Rail Creek and 0.2 mile on Kangaroo Creeks (Quigley, 2006a). No surveys have been conducted on other tributaries.

Current Habitat Function and Primary Limiting Factors

Streamflows in the East Fork of the Scott River are usually adequate to allow adult coho salmon and steelhead to enter the drainage and spawn even if precipitation has not been significant in the fall. The limiting factor for salmonids reaching spawning areas in the East Fork is the low flow barrier created by the aggraded channel associated with mining tailings in the upper portion of the mainstem Scott River (see discussion below). Coho salmon may begin entering the East Fork as early as late November and begin spawning shortly thereafter. Adequate spawning gravels are limited in some reaches of the East Fork as the tail-outs of pools and riffles are dominated with oversized cobble.

Excessive summer water temperatures in the East Fork may be a primary limiting factor with regard to juvenile salmonid rearing habitat, although cold water springs in the reach may provide local thermal refugia. Water temperatures at monitoring sites routinely exceed 19°C (62°F) and lethal temperatures (24-26°C; 75-79°F) are often approached by the first week of August. High summer water temperatures in the East Fork are partially related to the geography of the drainage, but are also affected by numerous management factors including upland management, historical mining activities that occurred primarily prior to the 1950's, channelization resulting in downcutting, infrequent meander pattern, riparian degradation, water diversion and tailwater return, and debris flows. Many of the cold water tributaries that juveniles may have utilized historically are now inaccessible or difficult to access due to human-caused migration barriers (Rail and Mill Creeks are completely inaccessible above barriers, while Kangaroo and Grouse Creeks may have low flow barriers).

Many of the tributaries to the Scott River, including the East Fork, contain very cold water in the winter, ranging from one to two degrees C (34-36°F) during the coldest periods and four to five degrees C (39-41°F) during most winter months. To avoid these extreme temperatures, overwintering juveniles may seek warmer, calmer water in side channels and back waters. Just as fish are assumed to move upstream in the summer in search of cooler water, juveniles may move downstream in search of warmer water in the winter. Many of the backwater side channel habitats in the East Fork lack cover and complexity or have been disconnected from the active channel.

The majority of the coho salmon and steelhead smolt out-migration in the mainstem Scott River typically occurs between April and early June (Chesney et al., 2004; Chesney et al., 2007). However, a tributary outmigrant trapping study conducted by SQRCD in 2005-2006 suggests that coho salmon may migrate from tributary streams, including the East Fork, earlier in the season (Yokel, 2006). Out-migration from the East Fork prior to June is rarely adversely affected.

South Fork Scott River

The South Fork of the Scott River drains the Salmon Mountains in the southwest portion of the Scott Valley and flows in a northeast direction towards its confluence with the East Fork at the town of Callahan where the two forks meet to form the mainstem of the Scott River. Elevations in the South Fork sub-watershed range from a low of 3,120 feet at Callahan to 7,400 feet at the Scott-Salmon divide. The South Fork drains 25,133 acres, which represents 4.8 percent of the Program Area. The morphological characteristics of this sub-basin include small, low-order, steep headwater tributaries which are significantly influenced by snow accumulations and runoff which transport quickly through steep stream reaches to the lower gradient Scott River. This sub-basin is comprised primarily of commercial forestland and wilderness areas with scattered rural residences along the South Fork.

Agricultural activity in the South Fork drainage includes mountain range grazing in the summer and fall and pasture production. The areas of the South Fork under agricultural production are limited and not contiguous. Nearly all irrigated pasture is flood irrigated from the South Fork and its tributaries. Livestock is watered through surface diversions or direct stream access. Methods to divert water from the stream consist primarily of seasonal gravel push-up dams and hand stacked rock and cobble diversion structures directing a portion of the streamflow into diversion ditches. Irrigation usually begins by early May and continues through the irrigation season (defined as April 1 through October 15 in the Scott River Decree) while stock water diversion continues throughout the winter in reduced volumes.

There are six active diversions with a combined adjudicated diversion volume of approximately 16 cfs.⁹ The estimated volume of water diverted is less than 7 cfs during the late summer at baseflows. Livestock water diversion volume is estimated at 1 to 3 cfs in December. Diversions occur on the South Fork, and all the tributaries (Jackson, Grizzly, and Boulder Creek) except Fox Creek. Of the six diversions, five are within the known or presumed range of coho salmon and are screened according to CDFG/NMFS standards. One of these, the Boulder Creek diversion point, is likely outside of coho salmon use but is nevertheless screened. The remaining diversion (Jackson Creek) is believed to be upstream of coho salmon accessibility due to the steep gradient and a potential migration barrier.

The riparian conditions of the South Fork sub-watershed are generally poor. Mining tailings dominate the narrow alluvial valley and fines are often not present. There appear to be adequate seed stock of alder, black cottonwood, and some willows and conifers, but areas suitable for regeneration are scattered. Existing riparian areas are usually not contiguous, limited to single rows of tress, or set back from the active channel. The South Fork has limited access to its flood plain due to the constricting effect of the tailing piles, preventing deposition of fines and recovery of the riparian area. Summer grazing may limit some riparian regeneration between Boulder and Fox Creeks.

⁹ A 30-day averaging provision included in the Scott River Decree allows for an estimated maximum diversion of approximately 20 cfs from these diversions.

Stream temperature data have been collected at two locations on the South Fork and its tributaries since 1996. Summer water temperatures in the South Fork range between 15-17°C (59-63°F). Temperature conditions are generally favorable during the summer. Streamflow data were collected by the USGS on the South Fork at South Fork Road, approximately one mile upstream of Callahan, for only two years (1958 - 1960). The daily average flow during this two year period was 8 to 9 cfs in August and September. A streamflow gage operated by DWR at the same location since 2002 shows a wide variation in summer baseflows, ranging from 12 cfs in 2003 (wet year) to as low as 2 to 4 cfs in 2002 and 2004 (dry years).

The South Fork of the Scott River is known to support coho salmon and steelhead. To the best of SQRCD's knowledge, coho salmon are known to be present in the South Fork one out of three brood years (2001...2004...2007) (Quigley, 2006a). The full extent of the coho salmon range within the South Fork is unknown, although adult surveys have found adult coho salmon as high as upstream of the Fox Creek confluence (SQRCD, 2005; Yokel, 2008). Coho salmon have been found spawning in the lowest quarter mile of Boulder Creek, but the gradient is likely too steep above this point.

Current Habitat Function and Primary Limiting Factors

Streamflows in the South Fork are usually sufficient to permit adult coho salmon access during the spawning migration, although stock water diversions reduce flows somewhat in December. Similar to migration conditions for the East Fork discussed above, the limiting factor for coho salmon reaching spawning areas in South Fork appears to be the low flow conditions formed by the mining tailings in the mainstem of the Scott River. Coho salmon may begin entering the South Fork as early as late November and have been observed spawning as early as mid-December. Adequate spawning gravels are limited in some reaches of the South Fork as the tail-outs of pools and riffles are dominated with oversized cobble. This is likely a result of steep gradient and heavy historical mining activity (see Chapter 3.2 Geomorphology, Hydrology and Water Quality) that prevents access to the flood plain, limiting deposition of spawning gravels. Coho salmon were noted spawning in sub-optimal gravel material and conditions in December of 2001 as suitable spawning gravel was lacking (Maurer, 2002).

Over-summering habitat in the South Fork of the Scott River appears to be adequate, although pools, woody debris, and cover availability are limited. Water temperatures reach levels of concern in the lower reach, but are not considered lethal. The cold water tributaries to the South Fork sub-watershed typically have a relatively steep gradient and anadromy appears to be limited to the lowest reaches. The lowest reaches of both Boulder and Fox Creeks appear to contain adequate pools and instream cover, although woody debris is lacking.

Winter water temperatures in the South Fork typically range between 1 to 4°C (34-39°F). As discussed above for the East Fork, over wintering juveniles may seek warmer, calmer water in side and back channels or may exit the sub-watershed searching for warmer conditions. There are few side channels and backwater areas in the South Fork and spring snow melt conditions (i.e., high velocities created by steep grade and constricted channels) can be severe for 0+ and 1+ fish. Lack of cover and complexity in the South Fork likely exacerbates this situation. Impacts of past

mining activities on the morphology and hydrology of the alluvial areas likely influenced the current lack of side channels and backwater habitats.

Out-migration of coho salmon and steelhead smolts from the South Fork to the mainstem Scott River is rarely adversely affected by low flows.

Wildcat Creek and Sugar Creek

Wildcat Creek and Sugar Creek are neighboring streams located in the southwestern portion of Scott Valley. Wildcat Creek's confluence with the Scott River is one mile below the confluence of the East and South Forks (Callahan) at RM 52. Sugar Creek's confluence with the Scott River is two miles further downstream (RM 50). Sugar Creek and Wildcat Creek are combined in this description due to their similar location and geomorphology. The lower section of both streams is heavily impacted by piles of tailings, and agricultural activity along the streams is similar. Wildcat Creek has a smaller drainage (4,700 acres) than Sugar Creek (8,914 acres). Elevations range from over 7,000 feet at the headwaters to 3,000 at the confluences with the Scott River.

Agricultural activity is limited to the mid-section of Wildcat Creek and the mid- and lower sections of Sugar Creek. There are some indications that tail water re-enters Wildcat Creek at several locations, which may affect summer water temperatures. Most water diverted from the Sugar Creek drainage is utilized for pasture production. Livestock is watered through surface diversions in both streams but winter diversions for stock water purposes are limited to a small diversion on Wildcat Creek. Diversion structures typically consist of seasonal hand stacked rock and cobble diversion structures. The diversion season identified in the Scott River Decree extends from April 1 through October 15, but actual diversions typically begin in early May.

An estimated maximum of 10 cfs is currently diverted in the Wildcat Creek watershed from three active diversions during the spring. This volume is reduced to approximately 2 cfs by early fall. The two lower active diversions are located within known or presumed coho salmon habitat but all three are screened. In the Sugar Creek watershed, an estimated maximum of 12 cfs is currently diverted from two active diversions in the system in the spring, which is reduced to approximately 2 cfs in the early fall. Both diversions are known to be within coho salmon habitat and are screened.

Riparian conditions on both streams appear to be fairly good except for areas affected by historical gold mining. Summer grazing occurs in the mid-section of Wildcat Creek. On Sugar Creek, livestock is excluded from the riparian corridor. There appears to be adequate seed stock of alder, black cottonwood, willows and conifers throughout both watersheds.

Water temperatures on both creeks have been monitored since 1998 and range between 15-17°C (59-63°F), typically peaking in early August. Both streams remain connected to the Scott River during most years. No current streamflow data exists for Wildcat Creek, but summer baseflows at the Highway 3 crossing are estimated to be less than 1 cfs. SQRCD has monitored streamflow in Sugar Creek since 2001. Summer baseflow (August – September) has varied between 1 to 3 cfs, depending on water year type. This agrees with data collected by the USGS between 1957 and

1959. Sugar Creek shows indications of carrying excess fine sediments, mostly decomposed granite, that appear to originate from upstream sources.

Both Wildcat Creek and Sugar Creek are known to support coho salmon and steelhead. Coho salmon spawning activity has been detected in Wildcat Creek in 2004-2005 and 2007-2008 (juveniles were also found in the summer of 2002) and in Sugar Creek primarily in 2001-2002 and 2004-2005, but also in 2005-2006 and 2007-2008 (Quigley, 2006a; Yokel, 2008).

Current Habitat Function and Primary Limiting Factors

As is the case with all of the upper tributaries to the Scott River, coho salmon spawning access to Wildcat and Sugar Creeks is limited by the low flow barrier created by the mine tailings in the mainstem of the Scott River. Streamflows in Wildcat Creek are likely sufficient to allow adult coho salmon to enter the lower reaches of the system by mid-December. The stock water diversion of less than 1 cfs slightly reduces winter streamflows in Wildcat Creek. Adequate spawning gravels are available through the lower two miles of the stream. Flows in Sugar Creek usually allow adult coho salmon and steelhead to enter the lower reach of the system (below Highway 3) to spawn by early December. Adequate spawning gravels are limited to the reach just above Highway 3 down to the confluence with the Scott River. Above this reach, there are only a few areas that possess adequate spawning gravel. In the spawning season of 2004, coho salmon were observed spawning in imported leach rock used to construct temporary stream crossings.

As noted above, summer water temperatures in both streams are suitable for juvenile coho salmon rearing. Riparian cover is present in most reaches, but LWD appears to be limited. SQRCD (2005) suggests that while more pools and instream cover would likely benefit rearing conditions, volumes of summer baseflows are likely a more important limiting factor for coho salmon production in these two creeks. The recent installation of diversion piping, a CDFG-funded project, has resulted in improved summer baseflows in Sugar Creek, but no such efforts have been made on Wildcat Creek.

As is the case in many Scott River tributaries, water temperatures in lower Sugar Creek range between 1 to 4°C (34-39°F) during the winter months. Over-wintering juveniles may be seeking warmer, calmer water in side and back channels or may be leaving the system in search of warmer water. There are few side channels and backwater areas in Sugar Creek. A paucity of instream cover and LWD limits winter holding areas. Wildcat contains several areas where side channels and backwaters exist, but mine tailings limit the floodplain and potential side channel development.

The tail end of the out-migration of coho salmon and steelhead smolts may be impeded by low flow conditions created by the mine tailing in the mainstem of the Scott River by late June.

French Creek

The French Creek watershed is located in the southwestern portion of the Program Area. Its confluence with the main river is located at RM 49. The watershed area is 28,584 acres (5.5 percent of total Program Area). North Fork French Creek and Miners Creek are two major

tributaries to French Creek. Elevations in the drainage range from 7,400 feet at the headwater peaks to 2,950 feet at the confluence. Decomposed granite is the parent material for portions of French Creek making the system more susceptible to erosion and contribution of fine sediments.

Agricultural activity in French and Miners Creeks extends from the headwaters to the confluence with the Scott River, ranging from summer grazing to irrigated crop production, but mostly focused on irrigated (mostly flood irrigated) pasture production. Most of the acreage in French Creek is under pasture production for cattle (some for horses) with some under alfalfa production. Agricultural activity within Miners Creek is limited to pasture production. Summer rangeland grazing also occurs in Miners Creek. Livestock is watered through surface diversions in both streams but winter stock water is diverted only in French Creek. Methods to divert water from the stream and into the ditches consist primarily of bolder vortex weirs. Irrigation may begin on April 1 and continue through the adjudicated diversion season (September 30).

Diversions from French Creek are defined by the French Creek Decree (No. 14478, 1958) and are watermastered by DWR. Thus, diversion volumes and history of diversion is better documented in French Creek than any other stream in the Program Area. Irrigation season identified in the decree begins April 1 and continues through September 30, with reduced diversions during the remainder of the year for “the amount required for domestic, stock water, or other beneficial uses.” An estimated maximum of 21.5 cfs can currently be diverted from 13 active diversions on French Creek. Approximately half of this volume is diverted in late summer. Eleven of the 13 diversions are known or presumed to be within reaches accessible to coho salmon and are screened. On Miners Creek, an estimated maximum of 2.5 cfs is currently diverted from three active diversions during the spring. As of the summer of 2008, the two active diversions in Miners Creek were screened.

The riparian conditions on French and Miner Creeks are relatively good and appear to be improving. Miners Creek experiences summer grazing within the riparian area along much of the stream. Riparian plantings and fencing on French Creek and the lower-most mile of Miner Creek were completed in the winter of 2005. The lower reach of French Creek has shown the most marked regeneration (new riparian establishment and encroachment on the stream, improving width-depth ratio and sediment transport/sediment trapping). There appears to be adequate seed stock of alder, black cottonwood and conifers throughout the watershed, but species of tree willows are lacking in the mid-sections of French Creek.

Stream temperature data have been collected by SQRCD (Quigley, 2006b) annually in French Creek since 1997. Temperatures in the upper reaches (above the confluence with Miners Creek) generally do not exceed 16-18°C (61-64°F) during the summer. Temperatures from the confluence of Miners Creek to the mouth may reach 20°C (68°F). No stream temperature data have been collected in Miners Creek. DWR has maintained a streamflow gage on French Creek just above the confluence with the North Fork French Creek since the 1950s. This gage is only operated during the diversion season.

The French Creek watershed is utilized by coho salmon, Chinook salmon, and steelhead. Coho salmon of all three brood years are present in both French and Miners Creeks. The absolute extent

of coho salmon use is not known but, based on gradient, may be as high as the confluence of Horse Range Creek on French Creek (approximately RM 6.5 above the French Creek confluence with the Scott River). Adult coho salmon have been observed as high as Azeala Drive located above the Horse Range Creek confluence. The upper boundary of coho salmon use in Miner's Creek is unknown, but adult coho salmon have been observed as high as 1.1 mile from its confluence with French Creek.

Current Habitat Function and Primary Limiting Factors

Adult coho salmon attempting to access French Creek during the early portion of the migration season may be blocked by beaver dams near the confluence with the Scott River and by reduced flows due to stock water diversions. Based on SQRCD observations, French Creek's flow volume and connectivity to the Scott River are attained through natural flow accretion following reductions in diversions. Once diversions are reduced or stopped, flows can naturally increase to the point that adult salmonid access is achieved even if fall precipitation has not occurred (SQRCD, 2005). Stock water diversion, estimated at 2 to 3 cfs (SQRCD, 2005), may adversely affect access during early periods of the adult migration season. Side-channels in Miners and French Creek can experience low flows which may expose salmonid redds.

Coho salmon spawned extensively from the mouth of French Creek to the confluence of Miner's Creek and into Miner's Creek during the winter of 2004-2005 (Quigley, 2005). Both French and Miners Creeks flow through areas of decomposed granite parent materials that may affect the quality of available gravels. Miners Creek in particular contains large amounts of fine sediments, the source of which appears to be a high meadow in the upper watershed that experienced major down-cutting during the 1964 flood event (SQRCD, 2005).

As discussed above, juvenile salmonid populations in the French Creek watershed have been monitored annually since 1992. Most of the benthic macroinvertebrate data and stream temperature data collected in French Creek indicate that upper French Creek maintains excellent water quality throughout the summer. The implementation of upland sediment reduction efforts, riparian fencing and planting programs, and instream enhancement projects has improved over-summering habitat conditions. Surveys have found that juvenile coho salmon often occur in areas where woody debris has lodged in the active channel.

Similar to the other tributaries discussed above, winter water temperatures typically range between 1-4°C (34-39°F). Both lower Miners and French Creek have been known to freeze over during cold temperature periods. There are adequate side channels and backwater areas in French and Miners Creeks, allowing cover during high flow conditions. However, instream cover and complexity are generally lacking, especially in the lower 1.5 miles of French Creek.

French Creek usually remains connected to the Scott River except in late summer of very dry years. Thus, coho salmon smolt out-migration opportunities are usually available.

Etna, Patterson, and Kidder Creeks

Etna, Patterson, and Kidder Creeks are combined in the following discussion due to their proximity and similarities in function and management. The following stream reaches are discussed:

- Etna Creek – headwaters to confluence with Scott River (27,500 acres, RM 43);
- Patterson Creek – headwaters to confluence with Johnson Creek, where the two join to form Big Slough (approx. 4,000 acres, RM 6.8 on Big Slough);
- Kidder Creek – headwater to confluence with Scott River (50,144 acres, RM 2.3 on Big Slough).¹⁰

All three streams are located on the west side of Scott Valley and are aligned similarly, flowing in a northeasterly direction. The Marble Mountains to the west of Scott Valley are the source of the streams. Elevations range from their confluence with the Scott River at 2,800 feet to mountain peaks near 7,500 feet. Above 4,000 feet elevation, most of the precipitation is snow, which sustains tributary flows through the early summer months. The morphological characteristics of this area include headwater tributaries that are generally narrow, low-order, high gradient streams with lower gradient stream reaches at the valley floor. Streamflows are greatly influenced by snow accumulation and snowmelt runoff, which travel rapidly through the steep upper stream reaches, slowing down when flows reach the lower gradient valley reaches. The tributary stream channels are bordered by discontinuous alluvial floodplains in their lower reaches. Alluvial fans located at the base of the valley floor are relatively large. During the summer, the streamflows frequently become subsurface through the alluvial fan. This appears to be a natural condition experienced by each of these tributaries, but may have been exacerbated by past mining activities.

Agricultural activity in the three tributaries consists of pasture and alfalfa production. Pasture production is the primary crop and a significant percentage of the farmed acres are not irrigated beyond the middle of July. Diversions in each creek occur throughout the season, but are significantly reduced during baseflow periods in early fall. Riparian fencing is generally limited in this sub-watershed.

The Scott River Decree allows a maximum of 75 cfs to be diverted between April 1 and October 15 in the Etna Creek watershed. This volume is reduced to approximately 4 to 5 cfs at baseflow by the early fall. All nine diversions are known or presumed to be within coho salmon use and are therefore screened according to CDFG/NMFS standards. In the Patterson Creek watershed, the decree allows a maximum of 42 cfs to be diverted from five active diversions, but by the early fall, only approximately 0.5 cfs are diverted. All five diversions are screened. In Kidder Creek, the decree allows a maximum of 85 cfs to be diverted (actual diversions are reduced to 3 to 5 cfs in the early fall) from six active diversions, all of which are screened.

¹⁰ Although the reach below the confluence of Kidder Creek and Big Slough is locally referred to as Big Slough, the USGS map quadrangle map labels the reach below the confluence as Kidder Creek.

Overall riparian conditions in all three watersheds generally follow a similar trend of fair to good in the headwaters and the upstream portions of the alluvial fan, but become progressively poorer in the downstream reaches of the alluvial fans and into the valley floors. The only exception is the headwaters region of Kidder Creek where riparian conditions are poor due to a fire in 1955. Regeneration of riparian species and conifers in the incised canyon has been very slow.

Summer (May through October) water temperature data have been collected annually since 1997 in stream reaches above the alluvial sections of Etna, Patterson and Kidder Creek. Summer stream temperatures in upper Etna Creek and its tributaries are approximately 14-15°C (57-59°F). Temperatures in Etna Creek at its confluence with the Scott River range from 18-20°C (64-68°F). Summer stream temperatures in Patterson Creek above Highway 3 average approximately 17°C (63°F), but no temperature data have been collected in lower Patterson Creek. Summer water temperatures in upper Kidder Creek range between 16-19°C (61-66°F). All three streams disconnect from the Scott River (usually by July) and are dry below the Highway 3 crossings during the summer and fall. NCRWQCB (2005) measured base flow in Etna Creek in 2003 and reported a flow range of 3 to 6 cfs upstream of the agricultural diversions. SQRCD (2005) estimates baseflows in Patterson Creek at 1 to 3 cfs upstream of the agricultural diversions.¹¹

Surface flows in Patterson Creek resurface approximately 0.5 mile below the Highway 3 crossing and continue for approximately half a mile. Baseflows through this reach are minimal (estimated at less than 0.2 cfs), but provide important over-summering habitat for coho salmon. USFWS collected streamflow data on Kidder Creek (above all diversions) from 2002-2003. September baseflows ranged between 2 to 8 cfs (SQRCD, 2005). The North Coast Regional Water Quality Control Board (NCRWQCB) collected streamflow data on Etna Creek in the summer and fall of 2003 and baseflows were 3 cfs upstream of the diversions (NCRWQCB, 2005).

Etna, Patterson, and Kidder Creeks are currently utilized by coho salmon and steelhead. Coho salmon have been observed spawning in Etna Creek and Patterson Creek in 2001, 2004, and 2007 and in Kidder Creek in 2004 and 2007 (Quigley, 2006b; Yokel, 2008).¹² The known or presumed extent of coho salmon use, in terms of stream distance from the Scott River, is 5.5 miles in Etna Creek, 6.0 miles in Patterson Creek, and 7.3 miles in Kidder Creek.

Current Habitat Function and Primary Limiting Factors

The main limiting factor for adult coho salmon reaching spawning areas in all three creeks is the lack of surface flows through the alluvial fans. Significant precipitation is required to provide surface flow connectivity between the Scott River and the three creeks. However, while surface water diversions in this sub-basin may exacerbate the onset of dry channel conditions in the summer, the lack of fall connectivity does not appear to be directly related to diversions. For example, in December 2004 (i.e., after the surface water diversion season had ended), significant rainfall provided Patterson Creek with connectivity to the mainstem. Adult coho salmon were observed in the creek within 24 hours. One week later, however, spawning beds were dry and flows were less than 2 cfs in lower Patterson Creek even after all stock water diversions were

¹¹ The City of Etna diverts municipal water supplies from Etna Creek upstream of all agricultural diversions.

¹² Not all locations were surveyed in all years.

voluntarily shut off. Nevertheless, once the streams are connected, stock water diversions can have an impact on continued connectivity and adequate flows for migration and spawning, especially in Patterson Creek where SQRCD estimates that flows of approximately 8 to 10 cfs are required at the upstream end of the alluvial fan to achieve a hydrologic connection with Big Slough. While no known efforts have been made to determine flows required to provide connectivity for Etna and Kidder Creeks, flows in excess of 15 cfs are likely required at the head of the alluvial fans (SQRCD 2005). Etna and Kidder Creeks appear to be lacking quality spawning gravels in areas of perennial flows. Most of the bed load is oversized cobble and the habitat is dominated by riffles. In 2004, a significant percentage of the spawning occurred in the lower sections of these streams where gravels are adequate but flows do not persist year-round.

Juvenile summer rearing habitat is marginal in the three systems. Flows likely go sub-surface earlier in the season than they would otherwise because of the diversion of water for agricultural use. Summer rearing habitat is limited to a section of habitat bordered by excessive gradient (upstream boundary) and subsurface flows downstream. Patterson Creek contains a short (0.6 mile) section where flows resurface and provide valuable summer rearing habitat.

The canyon reaches utilized by coho salmon within this sub-watershed are typically dominated by bedrock and boulders. Side channels are present in the alluvial fan reaches but lack the structure, stability and cover associated with ideal over-wintering habitats. Cover and complexity are also lacking in the main channels through the valley floor segments, although the stream gradient is less in these areas and therefore high flow refugia are not as critical.

CDFG fish rescues of juvenile coho salmon and steelhead have been conducted in some years when the alluvial fan reaches have become dry, but rescued coho salmon are usually young-of-the-year fish, not outmigrating smolts (Whelan, 2007). Thus, smolt out-migration from Etna, Patterson and Kidder Creeks is likely not adversely affected by dry-backs in these streams (i.e., dry-backs typically occur after the end of the coho salmon smolt outmigration period).

Johnson Creek and Big Slough

Johnson Creek and Big Slough are located in the center of the Scott Valley and flow parallel to, and west of, the Scott River. Johnson Creek extends from its headwaters to the confluence with Patterson Creek where the two drainages join to form Big Slough. Big Slough continues to the confluence of Kidder Creek. This section includes a stream segment known locally both as the lowest reach of Kidder Creek or the continuation of Big Slough to its confluence with the Scott River. For the purposes of this document, the stream segment from the confluence of Big Slough and Kidder Creek to the confluence of the Scott River will be identified as Lower Kidder Creek. The only headwater area in this sub-watershed is located in the upper Johnson Creek drainage, and includes the Crystal Creek watershed. The remainder of the Johnson Creek, Big Slough, and Lower Kidder Creek area contains slough-like habitat characteristics, including flat gradient, side channels, high sinuosity, and backwater areas. Some reaches of all three streams have been straightened, but numerous areas retain their natural sinuosity and access to the flood plain.

Much of the Johnson Creek, Big Slough and Lower Kidder Creek sub-watershed is dominated by agricultural production. Irrigated areas surrounding the streams are primarily pastures, with limited grass or alfalfa production.

Water diversion volumes in this sub-watershed are unknown. There is one known active diversion on Johnson Creek, which is screened, three active diversions on Big Slough that were screened in the summer of 2008, and no known active diversions on Lower Kidder Creek.

Riparian conditions throughout this area vary from reaches that are devoid of riparian vegetation to areas with dense riparian corridors. All stream segments included in this area have shallow and stable water tables, as well as high quality soils that should allow for healthy riparian growth. Grazing access to the creeks has not been prevented in this area and grazing practices effectively minimizes woody riparian cover. Overstory species including ponderosa pines and cottonwood are lacking, as are alders. In general, shorter willow species and hawthorn trees form the majority of the existing riparian vegetation. No appreciable planting efforts have occurred on Johnson Creek or Big Slough, but riparian plantings and fencing on lower Kidder Creek have been successful. Big Slough retains much of its slough-like geomorphology but is lacking riparian vegetation in some locations, possibly due to anaerobic soil conditions.

Summer water temperatures have not been monitored due to the absence of surface flows during that season. However, water temperatures likely reach lethal levels prior to the channels drying out. Water temperatures are likely relatively warm in the winter compared to other areas, providing potential winter refugia for out-migrating juveniles. Water quality in Johnson Creek appears to be poor at times due to high levels of suspended sediments, presumably the result of unstable granitic soils and past human activities along the western slopes and watersheds of Scott Valley (see Chapter 3.2). These conditions extend into the Big Slough/lower Kidder Creek reaches, as well. Flow volume of these stream reaches is unknown. Although areas of upper Johnson Creek experience perennial flows, the sub-watershed's connection to the Scott River is usually severed in mid-July or early August.

Coho salmon and Chinook salmon presence in Johnson Creek is unknown, but steelhead are known to use the system and access by coho salmon is likely (adults were reported to be seen migrating up Johnson Creek in December 2004). Steelhead and coho salmon are known to utilize the Big Slough to access Patterson Creek and Kidder Creek where they spawn and likely rear. No known spawning areas exist through this section except for a potential section of Johnson Creek near the City of Etna. The extent of use by coho salmon is confirmed only to the confluence of Patterson and Johnson Creeks.

Current Habitat Function and Primary Limiting Factors

Spawning opportunities for coho salmon likely exist in Johnson Creek near the City of Etna, but no spawner surveys have been conducted in this reach. Access to this area during the adult migration period may be impeded by low flows. Big Slough has also not been surveyed for spawning activities, but the gradient in this reach is likely too low to provide suitable coho salmon spawning habitat. Lower Kidder Creek and Big Slough are important corridors to

spawning grounds in Kidder Creek and Patterson Creek discussed above, as well as potential spawning areas in Johnson Creek.

Little is known about the rearing potential of Johnson Creek and Big Slough. No inventories, surveys, or assessments have been completed. Year-round presence of steelhead in Johnson Creek near the City of Etna indicates that water temperatures may be adequate for juvenile coho salmon. As discussed above, much of this sub-watershed is dry during the summer and early fall and water temperatures likely become lethal before that, effectively eliminating any rearing opportunities in Big Slough and lower Kidder Creek.

Over-wintering conditions in Johnson Creek and Big Slough appear to be favorable and this may be an area where over-wintering juveniles gather. The gradient is low and winter water temperatures are thought to be warmer than in other streams in the watershed.

Out-migration conditions are unknown but thought to be acceptable through the middle of June, although warm water temperatures may be a concern.

Shackleford Creek

The Shackleford Creek watershed, including its most significant tributary, Mill Creek, drains a total of 31,869 acres (six percent of the Program Area). The headwaters are situated in the Marble Mountains at over 8,000 feet in elevation, dropping to 2,880 feet in elevation at Quartz Valley. Shackleford Creek flows into the Scott River at RM 25. Land use in the drainage is a combination of wilderness, U.S. Forest Service land, private timber, small residential, and agriculture in the Quartz Valley. Shackleford and Mill Creeks have alluvial fans at the base of the canyon reach where gradients flatten. The morphological characteristics of this area include headwater tributaries that are generally small, low-order, high gradient streams which drain to lower elevation, lower gradient stream reaches at the valley floor. Streamflows are greatly influenced by snow accumulations and snowmelt runoff, which transport quickly through steep stream reaches until flows reach the lower gradient valley. The tributary stream channels are bordered by discontinuous alluvial floodplains in their lower reaches. In the summer months, streamflows currently become subsurface through the alluvial fan, similar to the hydrologic conditions through the alluvial fans of Etna, Patterson, and Kidder Creeks. However, in the lowest reach of Shackleford Creek, this condition has been exacerbated by channelization efforts in the 1980s which resulted in an increase of elevation of the Shackleford Creek confluence with the Scott River, making this confluence too high. This has resulted in channel aggradation.

Agricultural activity in Shackleford and Mill Creeks includes year-round livestock production, dry land grazing, and irrigated crop production, but primarily focuses on irrigated (mostly flood irrigated) pasture production for livestock. Within the Shackleford Creek watershed, most of the acreage is under pasture for cattle production with limited areas utilized for grass or alfalfa production. Areas of upland summer range grazing occur in the headwaters. Most of the area in livestock production in Shackleford Creek is fenced to protect the riparian areas. Agricultural activity within Mill Creek is limited to pasture production and some upland summer rangeland.

Diversions from the Shackleford watershed are defined by the Shackleford Creek Decree (No.13775, 1950) and are currently water-mastered by DWR. The irrigation season identified in the decree begins April 1 and continues until October 31, with reduced diversions for specific amounts, priorities, and diversions for the remainder of the year (four diversions only). Upper and lower Shackleford Creek are separate in terms of rights and priorities. A maximum of 29.6 cfs can be diverted from upper Shackleford during high flows by the six current diverters, but 21.2 cfs is the maximum during normal operation in the early summer. By late summer, diversions above the alluvial fan are reduced to approximately 6 cfs. SQRCD estimates that even in the absence of summer diversions, flows may still become subsurface in the fan at that time of the year, a condition presumably resulting from the combination of natural geology and human practices such as channelization. In lower Shackleford Creek, five diversions divert a maximum of 20.6 cfs in the spring and approximately 11 cfs in late summer. SQRCD estimates that approximately 17 cfs are required to maintain a hydrologic connectivity with the Scott River. CDFG estimates an additional 8 cfs is required before adult coho salmon migration can occur. All nine active diversions on Shackleford Creek known or presumed to be within coho salmon use for this creek are screened with fish screens that meet CDFG/NMFS standards. Mill Creek is also divided into an upper and lower section. A maximum of 10.6 cfs can be diverted by the only diversion on upper Mill Creek. That diversion usually ceases operation by late summer due to lack of water. Three diverters on lower Mill Creek can divert up to 2.4 cfs in the spring and this volume is reduced to approximately 1 to 2 cfs at baseflows in the early fall. All active diversions on Mill Creek are within coho salmon use and are screened.

According to SQRCD (2005), riparian conditions on Shackleford and Mill Creeks are relatively good and improving due to riparian fencing efforts on both creeks and riparian plantings on Mill Creek, but overstory cover is scattered and riparian encroachment on the active channel is limited, especially on Shackleford Creek. The alluvial fans of both streams have poor riparian densities, likely due to the fluctuating water table and channel instability. There are areas that would likely benefit from riparian planting throughout Shackleford and Mill Creeks. Riparian functions related to channel stabilization and improving width-depth ratios in lower Shackleford Creek is likely limited by unstable and aggraded channel conditions. There appears to be adequate seed stock of alder, black cottonwood, willow species and conifers throughout both streams. According to SQRCD, riparian fencing programs initiated in 2000 have shown moderate to excellent riparian response.

Water temperatures have not been monitored over long periods of time in the lower alluvial sections of the watershed. However, data collected in 2003 and 2004 indicate that water temperatures in lower Shackleford and Mill Creeks can reach 21°C (70°F) during the peak summer months of July and early August (Quigley, 2006b). Limited long-term flow data are available for this sub-watershed. DWR has provided watermaster service since 1967 and also installed a continuous recording streamflows gage near the mouth of Shackleford Creek in 2003. Mill Creek is also gaged at Quartz Valley Drive. Stream flow data collected above all diversions in Shackleford and Mill in 2002 and 2003 showed the combined September baseflow varying from 2 to 13 cfs.

The Shackleford Creek sub-watershed, including Mill Creek, has historically provided habitat for coho salmon, Chinook salmon, and steelhead. During recent years, the system has only been used intermittently by Chinook salmon, as the mouth of Shackleford-Mill is often not open for fish passage during the Chinook spawning season (connectivity with the Scott River was not established until early December in 2003 and 2004, but was established in early November 2005). Both coho salmon and steelhead currently use Shackleford-Mill for spawning and rearing. The upstream boundary range of coho salmon use in Shackleford Creek is likely Shackleford Falls located upstream of the Shackleford-Mill confluence. The limit of coho salmon anadromy on Mill Creek is unknown but could be as high as 2.5 miles above the confluence with Shackleford Creek. All three coho salmon brood years are present in the Shackleford Creek drainage.

Current Habitat Function and Primary Limiting Factors

Shackleford and Mill Creeks contain adequate salmonid spawning gravels and contain high priority coho salmon spawning reaches (Quigley, 2007). However, the early part of the adult coho salmon and steelhead migration may be delayed due to the presence of dry channels in the lower watershed prior to the onset of precipitation. For example, in early December 2004, a flow of 17 cfs was recorded in Shackleford Creek, but this was insufficient to provide a hydrologic connection to the Scott River. This seasonal flow barrier is likely the most important factor limiting coho salmon in this sub-watershed. Overhanging vegetation is limited due to channel instability in sections of Shackleford Creek below the Mill Creek confluence.

Summer salmonid rearing habitat exists above the alluvial fan on Shackleford Creek and Mill Creek. Mill Creek provides a significant volume of the base summer flows below the confluence of the two creeks. Based on habitat typing completed in 2003, the sections of Shackleford and Mill Creeks that have year-round flows appear to offer high quality, complex habitat (Quigley, 2006c). Summer water temperatures may be the most significant limiting factor to this life stage in the lower reaches of Shackleford Creek. Several diversion structures limit fish passage during low flows.

Mill Creek provides relatively warm winter water temperatures typically above 8°C (46°F), which likely improves over-wintering conditions and shortens egg incubation periods. The Shackleford-Mill system contains numerous side-channel and backwater habitats.

The alluvial fans disconnect in mid-June and the mouth disconnects in mid-July, potentially affecting the very tail end of the smolt outmigration.

Moffett Creek

Moffett Creek is a tributary to the Scott River in the northeastern portion of the watershed and its confluence is at RM 32 near the town of Fort Jones. The Moffett Creek watershed encompasses approximately 145,850 acres (28 percent of total for the Scott River basin), but due to the relatively low annual precipitation of approximately 20 inches per year (USDA-SCS, 1972) in this sub-watershed, the contribution to the total Scott River water yield is likely considerably less than the acreage might imply. McAdams Creek, Soap Creek, Duzel Creek, and Cottonwood Creek are the major tributaries to Moffett Creek. Elevations in the drainage range from 6,050 feet

at the headwater peaks down to 2,700 feet at the confluence with the Scott River. The predominant soil types found in the watershed have a moderate to high erosion potential and exhibit a high water erosion hazard (USDA-SCS, 1983).

The majority of the watershed is in private ownership, except McAdams Creek, where the Klamath National Forest is the principal landowner. Timber production with seasonal livestock grazing is the primary land use in the upland areas. The comparatively level ground along the stream courses in the valleys is used for irrigated pasture and forage production. Water diversions for irrigation are limited to the period of April 1 to “about” October 15th as defined in the Scott River Decree. Domestic water rights appear in three of the schedules and may be exercised throughout the year but the combined total for the basin is only 0.08 cfs. No stock water rights appear in any of the Moffett Creek schedules. In the upper reaches, where perennial flow persists, gravity diversion dams and pumps can be used to divert water for irrigation, but wells are required in the lower watershed because surface flow subsides early in the summer. The total adjudicated water rights for the basin is 60.58 cfs. However; the majority of the irrigation water is from wells.

Historic and current land uses such as mining and agricultural practices, combined with the erosive nature of the soils, contribute to high fine sediment loads in the Moffett Creek watershed. Riparian vegetation and channel conditions are degraded over the majority of the stream course and channel incision is evident along the upper stream reaches. Commercial timber producers have begun to establish riparian livestock exclusion fencing, but only a small fraction of the stream is currently protected. Landowners adjacent to the stream throughout the valley reaches have historically used mechanical efforts to constrain the stream and enhance channel capacity by pushing up accumulated sediment into levees. However without any mechanism to stabilize the banks or fluvial analyses, these efforts have not been particularly successful and are repeated after high flow events. One of the major tributaries, McAdams Creek, has been extensively dredge-mined and the middle reaches are entirely buried in mine tailings.

Current Habitat Function and Primary Limiting Factors

Steelhead utilize Moffett Creek for spawning and rearing and there are rare fish salvage records for juvenile Chinook and coho salmon (CDFG, unpublished data). However, the lack of surface flow until winter, and the early depletion of flow in the summer, have greatly reduced spawning and rearing opportunities for coho and Chinook salmon (it is unknown if the fish in the salvage records are from spawning within the Moffett basin or exploiting ephemeral habitat for non-natal rearing). The stream is generally dry between its confluence with the Scott River and Highway 3 (RM 6) from early July until late November when rainfall recharges the aquifer. Although the gradient appears to be acceptable for coho salmon in the upper reaches where surface flows persists throughout the summer, current stream conditions and water temperature may limit salmonid production to steelhead. Water temperature data from Skookum Gulch (RM 21) indicate a maximum weekly average temperature of approximately 18°C (64°F) (Quigley et al., 2001).

Scott River – Callahan to Etna Creek

The upper section of the mainstem Scott River, between Callahan and the Etna Creek confluence, is approximately 13 miles long and flows in a northerly direction through the southern portion of Scott Valley. General landform processes have created a wide, flat floodplain and a sinuous channel pattern where bars, islands, side- and off-channel habitats are common. Elevation ranges from a high of 3,120 feet at Callahan to near 2,900 feet at the confluence with Etna Creek. Land use consists primarily of agriculture. The upper five miles of the river channel flows through an area severely impacted by historical mine tailings. Large piles of tailings cover the entire width of the floodplain throughout this section, limiting floodplain availability and resulting in the transport of excessive bed materials (primarily cobble) downstream, creating an unstable and aggraded channel. In addition to the East and South forks, the Wildcat Creek, Sugar Creek, and French Creek tributary sub-watersheds discussed above drain into this reach of the mainstem.

Agricultural activity in the upper Scott Valley includes both pasture and alfalfa production. Crop types change at Young's Dam (diversion of the Scott Valley Irrigation District) from pasture (south of Young's Dam) to alfalfa (north of Young's Dam). Instream conditions also appear to change at Young's Dam where down-cutting has occurred below the dam and aggradation has occurred above.

The upper Scott River contains a total of five surface water diversions with a maximum diversion rate of 100 cfs, with actual diversion amounts reduced to 12 to 15 cfs in the late summer/fall. Two of these diversions (Farmer's Ditch and Scott Valley Irrigation District) are the largest in the entire Program Area, diverting a combined 78 cfs. All five diversions have CDFG/NMFS approved fish screens.

Riparian fencing is present throughout the reach. In the reach containing the mine tailings, the channel is relatively unstable and lacks a floodplain. The lack of soil prevents riparian establishment. Between the tailings reach and the Scott Valley Irrigation District (SVID) diversion, channel stability and riparian conditions are better and appear to be improving, although riparian stands are not contiguous. Below the SVID diversion dam, riparian vegetation is sparse and channel down-cutting renders riparian restoration efforts generally unsuccessful.

Summer water temperatures in this reach range between 18-20°C (64-68°F). Warm temperatures of up to 22.5°C (72.5°F) from the East Fork mix with 18°C (64°F) water from the South Fork at their confluence. From the confluence downstream, the Scott River exhibits a general cooling trend from Callahan to approximately Fay Lane, where temperatures begin to rise again. Temperatures at the confluence of Etna Creek can reach 21°C (70°F). Flow data collected in 2002 and 2003 in the lower reaches of the East and South forks indicate that the combined September baseflow can range between seven to 25 cfs. A portion of this flow goes subsurface through the tailings reach, creating fish passage problems.

The upper reaches of the Scott River are used by coho salmon, Chinook salmon, and steelhead. Spawning of Chinook and coho salmon has been observed in this reach and steelhead likely spawn in this reach as well.

Current Habitat Function and Primary Limiting Factors

Access to spawning habitat is limited by the aggraded channel and braided channels through the reach containing the mine tailings. Coho salmon access to spawning areas below the tailings area is often available except during dry years or when fall precipitation arrives late. The lower half of this section (Fay Lane to Etna Creek) contains good spawning habitat and a relatively stable channel. Coho salmon have been noted spawning in the mainstem as low as just above the French Creek confluence. Spawning habitat from the French Creek confluence to Fay Lane is adequate but the cobble is often oversized. Coho salmon prefer to spawn on stream margins, where overhanging cover is present, or in side channels. While the riparian condition is improving through this reach, there are few side channels or margins that provide preferred coho salmon spawning habitat.

Summer rearing habitat through the mine tailings is poor but water temperatures are generally below 20°C (68°F) (Quigley, 2006b). There are few pools and very little instream cover/woody debris. The habitat improves in a downstream direction from the tailings, but water temperatures increase from Fay Lane down. The Farmer's Ditch and SVID diversions also divert a considerable volume of water which reduces available habitat. From SVID to Etna Creek, some channel down-cutting has occurred, but channel stability is generally good and the number of pools is adequate. Deficient features include a lack of cover/woody debris, warming water temperatures, and lack of flow from mid-July/early August through the onset of fall rains.

The quality of over-wintering habitat through this reach is varied. The tailings reach contains little cover, side channels or backwater areas while the reach from below the tailings to Young's Dam has numerous side channels, backwaters and improving cover. There are suitable areas for over-wintering from Young's Dam to Etna Creek, but refugia from high flows are limited.

Smolt out-migration opportunities are adequate through this reach except for the reach from the Farmer's Ditch diversion to 1.5 miles downstream. The hydrologic disconnect in the tailings reach usually occurs in late June or early July and thus only affects the extreme tail end of the out-migration period. Young-of-the-year coho salmon and juvenile steelhead are often trapped and rescued where surface flows stop (below Farmer's Ditch), but smolts have not been observed during these efforts. Thus, the primary concern with this reach is not smolt out-migration ability, but young-of-the-year habitat loss.

Scott River – Etna Creek to Scott Canyon

The mid section of the mainstem Scott River extends from the Etna Creek confluence approximately 17 miles north to Fort Jones, where it turns west and drains into Scott Canyon three miles below the Shackleford Creek confluence. Elevation ranges from 2,900 feet at Etna Creek to 2,630 feet at the upstream end of the canyon area. Land use consists primarily of agricultural production. Significant portions of the Scott River in this reach have been straightened, banks have been stabilized using riprap to prevent erosion, and levees prevent channel access to the flood plain. In areas where channelization has not occurred, the river consists of a wide, flat floodplain and a sinuous channel pattern where bars, islands, side and/or off-channel habitats are common. A substantial reach of the Scott River through Scott Valley is very flat (0.2 percent slope) and contains sand as the predominant substrate type. The northern

and southern ends of this reach, however, possess spawning-sized gravels. Tributary sub-watersheds draining into this reach of the river include Etna, Patterson, Kidder, and Shackleford Creeks. Moffett Creek, a potential coho-bearing stream, enters the river from the east near Fort Jones.

Agricultural activity in the middle reach of the Program Area consists primarily of alfalfa production with some pasture production. Alfalfa is irrigated until mid-late September while pasture is irrigated into October.

There are no known surface water diversions in this reach, but groundwater is used widely for irrigation. The effects of groundwater use on river flows and are discussed in Chapter 3.2.

Riparian conditions vary throughout this reach, ranging from moderate to non-existent, even though fencing has been installed on 95 percent of the sections where livestock grazing occurs. The channel is entrenched, allowing only narrow riparian corridors where vegetation does occur. SQRCD has implemented numerous planting efforts throughout this reach with mixed results because channel down-cutting and variable water tables prevent the establishment of vigorous, contiguous growth. Planting success is limited to specific reaches in this section where water tables are stable.

Summer water temperatures at the upstream end of this reach average 19-20°C (66-68°F), and continue to rise moving downstream to approximately three miles upstream of the Shackleford Creek confluence, at which point water temperatures gradually decrease by about 3°C until river flow reaches Scott Canyon (Watershed Sciences, 2004). Temperatures in Scott Canyon gradually increase in a downstream direction and peak at approximately 26°C (79°F) near the confluence with the Klamath River (Watershed Sciences, 2004). Streamflow data is collected by a USGS gage at the downstream end the reach. Data show a net increase in streamflows between Callahan and the USGS gage. In dry years the river can become disconnected near Fort Jones. Data from the USGS gage shows that during average years, the August and September baseflow is approximately 20 to 30 cfs (SQRCD, 2005).

This segment of the Scott River is used by coho salmon, Chinook salmon, and steelhead. Spawning Chinook have been observed through this reach, but coho salmon have not been observed spawning here.

Current Habitat Function and Primary Limiting Factors

Although some spawning gravels may exist, preferred conditions for coho salmon, such as side channels or gravels on stream margins with overhanging vegetation, are rare. The primary coho salmon habitat function this reach of the river provides is that of a migratory corridor.

Although some areas of potentially suitable summer rearing habitat exist within this reach, water temperatures are likely too high from mid-July through early September. Instream cover and woody debris are lacking throughout this reach.

Suitable over-wintering areas are found throughout this reach as the gradient is very low (0.2 percent). Cover features such as LWD are generally lacking throughout the reach, but backwaters providing potential holding areas are present in areas that have not been channelized.

Flow volumes are adequate to allow for unimpeded smolt out-migration.

Scott River Canyon

The section of the Scott River flowing through Scott Canyon and to its confluence with the Klamath River is part of the Program Area, but few agricultural operations are located in this steep and narrow section of the watershed. However, the section is discussed due to the fact that land use practices, including Program activities, directly affect habitat conditions in this reach.

Current Habitat Function and Primary Limiting Factors

In general, the Scott River canyon reach is fairly steep, narrow, and relatively unimpaired. Large cobble and boulders dominate the channel. Physical habitat features appear to be adequate for rearing juvenile salmonids, but summer water temperatures are high due to the heating effect of the Scott Valley. Juvenile coho salmon, Chinook salmon, and steelhead have all been observed rearing in this reach (Pisano, 2002). Cold water inputs from hillslope seeps and tributaries appear to provide adequate water temperatures in some areas of the mainstem, and coho salmon showed somewhat greater preference for these areas than did Chinook and steelhead (Pisano, 2002). Three tributaries to the Scott River in this reach, Canyon Creek, Kelsey Creek, and Tompkins Creek, are utilized by coho salmon for spawning and rearing (Maurer, 2006; Quigley, 2006a).

Limiting Factors

A Limiting Factors Analysis of the coho salmon in the Program Area is currently being conducted by the Scott River Watershed Council (SRWC). A recent draft document prepared by SRWC consists primarily of a Plan of Action for future analyses to determine and quantify factors limiting coho salmon populations in the watershed (SRWC, 2006). Although few of the studies have been completed, SRWC believes that a number of limiting factors have already been scientifically documented in the Scott River (SRWC, 2006). Furthermore, SSRT (2003) identified various current conditions in the watershed that likely adversely affect coho salmon.

In addition to these reports, various surveys and studies have been conducted over the past decade, focusing on the collection of fisheries population data, habitat use, and habitat conditions. Combining the results and observations of these studies with the limiting factors identified by SRWC (2006) and SSRT (2003) allows us to identify suboptimal habitat conditions that are prevalent throughout the watershed and that, if addressed appropriately in future management efforts, may help, at a minimum, to stabilize salmonid populations and possibly aid in the recovery of coho salmon. While the majority of these factors have been mentioned in the previous descriptions of the various sub-watersheds, the discussion presented below summarizes the current understanding of the primary features of existing aquatic habitat impairment in the Program Area.

Streamflows

Chapter 3.2, Geomorphology, Hydrology, and Water Quality, in this Draft EIR presents historic streamflow data collected at the USGS gage, located at the upstream end of Scott Canyon (i.e., the downstream end of the Program Area), since the early 1940s. Streamflow duration curves plotted for three periods of streamflow records (1942-1962, 1963-1983, and 1984-2005) show that current high and moderate streamflows have remained largely unchanged during the past 65 years, but that summer baseflows (i.e., those flows exceeded more than 80 percent of the time) have been reduced significantly since the early 1940s. Comparing historic (1942-1976) to modern (1977-2005) periods, Van Kirk and Naman (2008) noted a significant decline in Scott River discharge during the low-flow season (approximately July through October); the authors attributed over 60 percent of this observed decline to local factors such as increases in irrigation withdrawal and consumptive use. The authors also conclude that a return to pre-1970s irrigation patterns in the Scott Valley could potentially increase streamflow by an average of 23 cfs during the July 1-October 22 period (Van Kirk and Naman, 2008).

As discussed previously, suitable streamflows throughout the year are important for the various life stages of coho salmon, Chinook salmon, and steelhead. Streamflows need to be sufficiently deep and continuous for adults to complete their migration from the ocean to freshwater spawning grounds unimpeded. Excessive water velocities during the winter and spring incubation and emergence period may scour out redds or flush fry out of the drainage. Low summer baseflows reduce the effective juvenile rearing habitat availability, may result in water temperature increases, and can cause stress or mortality to riparian vegetation.

Existing evidence suggests that water diversions in the Program Area can lead to direct mortality of coho salmon. CDFG staff conduct weekly conference calls with the watermaster to determine the likelihood of fish becoming stranded as a result of water diversions and at times have conducted capture-and-relocation efforts to minimize fish mortality from stranding. Data gathered by CDFG during fish rescue operations in the Program Area indicate that between 1993 and 2006, a total of over 46,000 juvenile coho salmon have been salvaged by CDFG staff during dry-back events downstream of water diversion sites. Salvage efforts on the mainstem accounted for the single largest contribution of approximately 16,000 coho salmon. Since the listing of coho salmon as a threatened species under CESA in March 2005, approximately 14,600 coho salmon have had to be salvaged within the watershed. Although the argument may be made that rescued fish are not dead fish since the very intent of the operations is to save fish from dying, the fact remains that in the absence of the diligent efforts of CDFG staff, these fish would have perished. While natural processes, including decreased streamflows after snow melt and increased water temperature in summer, contribute to deteriorating habitat conditions and fish stranding, water diversions exacerbate these conditions.

As opposed to the incidences of substantial or complete channel dewatering discussed above, the effects of diversions on coho salmon and other fish are far more difficult to determine when only a portion of the streamflow is diverted, as is the case at many of the diversion sites in the Program Area. Intuitively, the reduction of streamflow reduces the overall volume of water available to fish and results in adverse effects to fish through habitat loss and/or degradation. However, the

effects of variations in streamflow on fish survival and growth can be difficult to estimate because of the possible confounding effects of associated increases in water temperature and population densities (Harvey et al., 2006). Nevertheless, some research has been conducted on these effects. For example, researchers studying the effect of streamflow on survival and growth of resident rainbow trout by manipulating streamflows entering experimental and control reaches in a small stream in northwestern California found that the mean body mass of fish in control units increased about 8.5 times as much as that of fish in units with reduced streamflow (Harvey et al., 2006).

A reduction in habitat availability is the most obvious effect of water diversions and the relationship between streamflow and habitat availability has been investigated in numerous studies. For example, an Instream Flow Incremental Methodology (IFIM) study of lower Scott Creek (not Scott River) in Santa Cruz County, found that optimum habitat conditions for juvenile steelhead and coho salmon in Scott Creek are provided at 20 cfs, and that only half of the maximum habitat remains at 5 to 6 cfs (Snider et al., 1995). Nevertheless, while habitat availability is a measurable parameter, the response of fish to reduced habitat availability is more difficult to quantify.

Another effect of habitat reduction, if all other factors remain constant, is an increase in population density. Studies of varying densities of rearing juvenile coho salmon in hatcheries have found that an increase in fish density was associated with significant decreases in weight, length, condition factor, and food conversion efficiency; elevated body water content; reduced fat and protein contents; and increased mortality (Fagerlund et al., 1981). While this study was not conducted in a natural setting and may therefore not be directly applicable to density variations in streams and rivers, the fact that a hatchery experiment allows for control of all parameters (e.g., food supply and temperature) eliminates some of the confounding effects inherent in natural settings.

The reduction of water may also result in increased inter-specific fish densities in natural settings. For example, steelhead and coho salmon are known to be significant competitors for resources when not segregated by natural habitat diversity and preference. Steelhead densities have been shown to have a negative effect on coho salmon growth as measured in weight change. Harvey and Nakamoto (1996) showed that weight change in coho salmon was positive among fish held in the absence of steelhead, neutral among coho salmon held with natural steelhead densities, and negative among those held in twice the natural steelhead densities. The more aggressive coho salmon typically dominate interactions among similar-sized juvenile salmonids (Moyle, 2002). However, Moyle (2002) points out that “when habitat conditions in California streams favor juvenile steelhead so that their densities are higher than those of coho, growth of coho may be suppressed through competition for food in crowded pools, especially when flows are low, and through aggressive interactions with large 1- to 2-year-old steelhead.”

Impaired streamflows are likely the most significant factor limiting coho salmon and CDFG fish species of special concern in the Scott River watershed. It is important to recognize that the effects of water diversions on coho salmon and the other CDFG fish species of special concern and their habitats are in many instances the cumulative result of the water diversions in total

throughout the watershed. While some individual diversions might not significantly affect fisheries resources and their habitat because, for example, they are already screened or the amount of water diverted is small, the total volume of water diverted in the watershed results in degraded conditions that contribute to mortality and other adverse impacts to fisheries resources and aquatic habitat quality within the Program Area. This is another reason the Program is watershed-wide.

Water Quality

Coho salmon and other salmonid species are dependent on suitably low water temperatures and spawning gravels relatively free of fine sediments. Increased water temperatures decrease the area and volume of suitable habitat for salmonids, decrease survival during rearing, and migration, and can be lethal. An excess of fine sediment such as sandy and/or silty materials is a significant threat to eggs, alevins, and fry because it can reduce the interstitial flow necessary to regulate water temperature and dissolved oxygen, remove excreted waste, and provide food for fry. Fine sediments may also envelop and suffocate eggs and alevins, and reduce available fry habitat. In the Scott River basin, elevated temperatures and an excessive rate of sediment delivery contribute to the non-attainment of beneficial uses associated with the cold water fishery, specifically the salmonid fishery (NCRWQCB, 2005).

The Action Plan for the Scott River Watershed Sediment and Water Temperatures Total Maximum Daily Loads prepared by NCRWQCB (2005) includes a sediment source analysis identifying the various sediment delivery processes and sources in the Program Area and estimates delivery from these sources. Identified sources include landslides, large and small discrete streamside features, soil creep, and roads. The largest human-caused sediment sources are from streambanks and are the result of multiple interacting human activities. Results also show that the current sediment delivery is 167 percent of the natural sediment delivery in the Program Area. The sediment Total Maximum Daily Load (TMDL) is set at 125 percent of natural sediment delivery, which equals 560 tons of sediment per square mile per year (NCRWQCB, 2005).

The temperature source analysis prepared for the TMDL identifies the various water heating and cooling processes and sources of elevated water temperatures in the Program Area. The source analysis found that the primary human-caused factor affecting stream temperatures is increased solar radiation resulting from reductions of shade provided by vegetation. According to NCRWQCB (2005), groundwater inflows are also a primary driver of stream temperatures in the Scott Valley. Diversions of surface water lead to relatively small temperature impacts in the mainstem Scott River, but have the potential to affect temperatures in smaller tributaries, where the volume of water diverted is large relative to the total flow (NCRWQCB, 2005).

Habitat Features

Salmonid species' need for habitat features such as LWD, pool availability and depth, and channel complexity are discussed above. Many reaches of the Scott River watershed lack these features. Although the upper reaches of tributary streams (i.e., where agricultural influences are limited or absent) often contain relatively natural aquatic habitat conditions, many of these

reaches are too steep for coho salmon use. Within the lowland valley portion of the watershed, riparian and instream cover are scarce, channel geomorphology is less complex, and water temperatures are high.

Although suitable coho salmon habitat in the watershed has been reduced during decades of agricultural and other land use activities, accessible areas of moderate to high quality habitat continue to be present in the Scott River watershed, particularly in the French Creek and Shackleford-Mill Creek drainages. In addition, moderately suitable salmonid habitat can be found throughout the Scott River watershed.

The potential impacts of agricultural diversions on summer rearing habitat in the watershed have received a considerable amount of attention since the federal and state listing of coho salmon as a threatened species in Northern California. Still, a thorough understanding of winter rearing habitat quality for juvenile survival in the Scott River is essential for the effective management of all life stages of coho salmon. For example, coho salmon have been shown to favor near-channel ponds with a hydrologic connection to the main channel of a stream or river (known as alcoves) over main channel habitats during high winter streamflows (Bell, 2001; Bell et al., 2001). Past channel modification practices (including beaver extirpation, channelization, streambank revetment, and elimination of riparian vegetation, and thus LWD) have reduced the channel complexity of the Scott River and its tributaries. Side-channels, oxbows, alcoves, and other deep water habitat with slow water velocities are now rare in the watershed. The paucity of such habitats is likely a limiting factor for winter rearing of juvenile coho salmon.

Migration Barriers

Barriers to adult up-migration, smolt out-migration, and juvenile intra-watershed migration may be complete (no passage under any flow levels) but are more often partial, such as migration impediments created by shallow flows. Structural impediments such as small dams are in many instances partial barriers as they may be passable during high flows or, in the case of seasonal push-up dams, only affect certain life stages. Larger dams, such as the one on Rail Creek, completely block fish passage. Within the Program Area, low or entirely absent surface flow conditions during the summer and fall are some of the most significant migration barriers for coho salmon and CDFG fish species of special concern.

Coho Salmon Brood Year Lineages

While evaluating the effect of the factors discussed above on coho salmon productivity within the watershed, it is important to keep the rigid three-year life cycle of coho salmon in mind. Although aquatic habitat conditions in the Scott River and its tributaries have been impaired by land use practices over the past 100 years, outmigration studies conducted by CDFG resulted in population estimates of over 75,000 smolts emigrating from the watershed during the spring 2006 migration period compared to less than 1,200 smolts during the spring of 2005 (Chesney et al., 2007). Smolts captured in 2006 were born in the spring of 2005 and are thus members of the one remaining relatively strong brood lineage (2001...2004....2007). The 2006 smolt data, as well as data collected on the spawning adults (2004/2005) and rearing juveniles (2005) suggest that even

though coho salmon populations have experienced declines over historic numbers, the watershed is capable of producing relatively large numbers of juvenile coho salmon when sufficient numbers of adults return to the system to spawn and flows are adequate. One of the most important factors in the low numbers of coho salmon observed during two out of every three years may therefore be the low population numbers in and of themselves. Severely depressed brood lineages require a long period of time to recover and regain historic population sizes, even if habitat conditions are ideal and, conversely, a relatively strong brood lineage perpetuates itself even in less than ideal conditions.

It should also be noted that prior to 2007, many other coastal watersheds in California showed similar coho salmon population trends consisting of a strong 2001...2004...2007 brood lineage and weak 1999...2002...2005 and 2000...2003...2006 lineages (e.g., Smith, 2002).¹³ Thus, the decline in coho salmon populations is at least partially a result of conditions or events that are not specific to any given watershed. Some of these factors are discussed below.

External Factors

While the limiting factors discussed above pertain primarily to conditions affecting coho salmon within the Scott River watershed, the anadromous life history of salmonids and lampreys also expose these species to factors outside the Program Area, including ocean conditions, migratory conditions in the Klamath River, climate conditions, and a number of highly variable factors. For example, recent studies have documented significant mortality in juvenile salmon and steelhead populations in the Klamath River due to infectious disease, primarily caused by the endemic parasites *Ceratomyxa shasta* and *Parvicapsula minibicornis*. In 2004, infection rates in juvenile Chinook salmon ranged from about 20 to 70 percent for *C. shasta* and from 40 to 96 percent for *P. minibicornis*. In 2005, dual infection rates at or near 100 percent were observed for consecutive weeks in April, a critical period for outmigration of juvenile anadromous fishes (USFWS, 2007).

Although freshwater habitat loss and degradation have been identified as leading factors in the decline of anadromous salmonids in California, climatic variations such as droughts, floods, and ocean conditions also affect these species. For example, a strong correlation between salmon abundance, as measured in annual catch, and Pacific Decadal Oscillation (PDO) cycles has been shown by researchers (Mantua et al., 1997). A warm phase PDO is typically associated with reduced abundance of coho and Chinook salmon in the Pacific Northwest, while cool phase PDO is linked to an above average abundance of these fish (Mantua et al., 1997). A marked decline in the 2007 coho and Chinook salmon returns was observed throughout the species' range in California and elsewhere along the Pacific coast (McFarlane et al., 2008). A recently developed ocean conditions index, the Wells Ocean Productivity Index (WOPI), reveals poor conditions during the spring and summer of 2006, when juvenile coho salmon from the 2004...2007 brood lineage entered the ocean (McFarlane et al., 2008).

¹³ The cited document states that only the "1993, 1996, 1999, 2002 year class" remains strong. However, this assessment is based on data collected during surveys of rearing juveniles. Thus the "2002 year class" is equivalent to the 2001 brood lineage.

3.3.2 Regulatory Framework

Federal and State Regulation of Special-Status Fish Species and CDFG Fish Species of Special Concern

Endangered Species Act

Under ESA, the Secretaries of the Interior and Commerce have joint authority to list a species as threatened or endangered (16 U.S.C. § 1533[c]). ESA prohibits take of endangered or threatened fish and wildlife species on private property, and take of endangered or threatened plants in areas under federal jurisdiction. Under ESA, “take” is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” USFWS and NMFS define “harm” in their regulations to include significant habitat modification that could result in take of a species. If a project would result in take of a federally listed species, either an incidental take permit under ESA section 10(a), or an incidental take statement issued pursuant to federal interagency consultation under ESA section 7, is required prior to the occurrence of any take. Such authorization typically requires various measures to avoid and minimize take and, if necessary, to compensate for take.

Pursuant to the requirements of ESA section 7, a federal agency reviewing a proposed project that it might authorize, fund, or carry out, must determine whether any federally-listed threatened or endangered species, or species proposed for federal listing may be present in the project area and determine whether implementation of the proposed project is likely to affect the species. In addition, the federal agency is required to determine whether a proposed project is likely to jeopardize the continued existence of a listed species or any species proposed to be listed under ESA, or result in the destruction or adverse modification of critical habitat proposed or designated for such species (16 U.S.C. § 1536[3], [4]).

NMFS administers ESA for marine fish species, including anadromous salmonids such as coho salmon, and USFWS administers ESA for non-marine species. Projects where a federally-listed species and/or its habitat are present and are likely to be affected by the project must receive authorization from either USFWS or NMFS. Authorization may involve a letter of concurrence that the project will not result in the potential take of a listed species and/or its habitat or it may result in the issuance of a Biological Opinion that describes measures that must be undertaken in order to minimize the likelihood of an incidental take of a listed species. Where a federal agency is not authorizing, funding, or carrying out a project, take that is incidental to the lawful operation of a project may be permitted pursuant to ESA section 10(a).

California Endangered Species Act

CESA (Fish and Game Code, § 2050 *et seq.*) prohibits take¹⁴ of an endangered, threatened, or candidate species unless the take is authorized by CDFG. CDFG may authorize take by permit provided: 1) it is incidental to a lawful activity; 2) the impacts of the authorized take are

¹⁴ “Take” means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. (Fish and Game Code, § 86).

minimized and fully mitigated; 3) the permit is consistent with any regulations adopted pursuant to Fish and Game Code, §§ 2112 and 2114; 4) there is adequate funding to implement the minimization and mitigation measures, and to monitor compliance with and the effectiveness of those measures; and 5) issuance of the permit will not jeopardize the continued existence of the species (Fish and Game Code, § 2081, subs. (b), (c)). Under CESA, the Commission maintains the lists of threatened species and endangered species (Fish and Game Code, § 2070). The Commission also maintains a list of candidate species for which CDFG has issued a formal notice as being under review for addition to either the list of endangered species or threatened species.

Fish and Game Code, § 1600 et seq.

Under Fish and Game Code, § 1600 *et seq.*, CDFG regulates activities that will “substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of any river, streams and lakes, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.” Before an entity may begin such an activity, it must notify CDFG and describe the activity. If CDFG determines that the activity described in the notification could substantially adversely affect an existing fish or wildlife resource, the entity must obtain a Streambed Alteration Agreement (SAA) before conducting the activity, which will include measures CDFG determines are necessary to protect the fish and wildlife resources the activity could affect.

Fish and Game Code, § 5901

Fish and Game Code, § 5901 makes it “unlawful to construct or maintain in any stream ... any device or contrivance that prevents, impedes, or tends to prevent or impede, the passing of fish up and down stream.”

Fish and Game Code, § 5937

Fish and Game Code, § 5937 requires “the owner of any dam [to] allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam.”

Goals and Policies

The Klamath Fishery Management Council

The Klamath Fishery Management Council (KFMC) was an 11-member federal advisory committee which included representatives from commercial and recreational ocean fisheries, the in-river sport fishing community, tribal fisheries, and state and federal agencies (CDFG, Oregon Department of Fish and Wildlife, NMFS, and U.S. Department of the Interior) that worked by consensus to manage harvests and ensure continued viable populations of anadromous fish in the Klamath Basin. KFMC developed a long-term plan for the management of in-river and ocean harvest of Klamath Basin anadromous fish.

Before the Klamath Act expired in 2006, the KFMC met three times each spring to review the past year's harvest of Chinook salmon, and to review predictions of Chinook salmon ocean abundance and harvests in the upcoming year developed by their Technical Advisory Team. KFMC then made specific recommendations to the agencies that regulate the harvest of Klamath Basin fish. These agencies include the Pacific Fishery Management Council (PFMC), Commission, Oregon Department of Fish and Wildlife, Yurok Tribal Fisheries, and Hoopa Tribal Fisheries. KFMC recommendations to PFMC were used to develop ocean salmon fishing seasons. PFMC then passed its recommended fishing seasons to the Department of Commerce, which has final authority in setting regulations for the ocean fishery.

In 2006 and 2007, PFMC severely limited the allowable catch of salmon off the California and Oregon coasts, in order to protect the depleted Klamath stocks. For 2008, PFMC took the unprecedented action of completely closing the salmon fishing season off the California coast due to severely depressed Sacramento River stocks. While the intent of the restrictions is to rebuild salmon stocks, they have also had the consequence of impairing the commercial, recreational, and tribal salmon fisheries.

Siskiyou County General Plan

The Conservation Element of the Siskiyou County General Plan includes general objectives relating to biological resources. These objectives include “to preserve and maintain streams, lakes and forest open space as a means of providing natural habitat for species of wildlife.” There are no Habitat Conservation Plans or other approved habitat plans that apply to lands within the Program Area.

3.3.3 Impacts and Mitigation Measures

Significance Criteria

To determine the level of significance of an identified impact, the criteria outlined in the CEQA *Guidelines* and Appendix G in the CEQA *Guidelines* were used. The following is a discussion of the approach used to determine whether the Program could have a significant effect on fisheries and aquatic habitats.

Under CEQA *Guidelines*, § 15065(a), if a project “has the potential to substantially degrade the quality of the environment; substantially reduce the habitat of a fish and wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare or threatened species”¹⁵ the lead agency must prepare an EIR for the project (CEQA *Guidelines*, § 15065, subds. (a), (a)(1)). CEQA *Guidelines*, § 15206(b)(5) specifies that a project shall be deemed to be of statewide, regional, or area-wide significance if it “would substantially affect sensitive wildlife habitats including but not limited to riparian lands, wetlands, bays, estuaries, marshes, and habitats for rare and endangered species as defined by CEQA *Guidelines*, § 15380”

¹⁵ “Endangered, rare, or threatened species” is defined in the Glossary.

(California Code Regulations, title 14, § 15065, subd. (b), (b)(5)). “Endangered, rare, or threatened species” and species that meet the definition of an endangered, rare, or threatened species under CEQA *Guidelines*, § 15380 are collectively referred to as special-status species in this Draft EIR.

In addition to the significance criteria in Appendix G for biological resources (discussed below), for the purpose of this analysis, the criteria in CEQA *Guidelines*, §§ 15065(a)(1) and 15206(b)(5) were used to determine whether any effect of the Program on fisheries and aquatic habitats could be significant. Hence, any effect of the Program that would “substantially degrade the quality of the environment,” “substantially reduce the habitat of a fish or wildlife species,” and/or “substantially affect sensitive wildlife habitats,” constitute a significant effect for the purpose of this impact analysis. The Program would “substantially degrade the quality of the environment” if it could render currently suitable fisheries habitat unsuitable (e.g., fine sediment deposition at levels that would impair salmonid spawning). The Program would “substantially reduce the habitat of a fish or wildlife species” if it could cause an overall reduction in current habitat availability (e.g., through migration barriers) or suitability (e.g., through increases in water temperature). The Program would “substantially affect sensitive wildlife habitats” if it could adversely alter the current use of a fisheries habitat area (e.g., fine sediment deposition at levels that would impair salmonid spawning). Also for the purpose of this impact analysis, an overall reduction of the current extent or ecological function of fishery habitat caused by the Program would constitute a “substantial, or potentially substantial, adverse change in . . . the physical conditions [in the Program Area],” and therefore would be considered a significant effect (CEQA *Guidelines*, § 15382).

In accordance with Appendix G in the CEQA *Guidelines*, the Program would have a significant effect on the environment if it could:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG or USFWS (or NMFS in the case of marine and anadromous species). For purposes of this analysis, substantial adverse effects on species are defined as effects that result in mortality of a substantial number of individuals or habitat modifications that would reduce the overall suitability of the habitat.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFG or USFWS (or NMFS in the case of marine and anadromous species). For purposes of this analysis, substantial adverse effects on sensitive natural communities are defined as effects that result in the overall reduction of the current extent or ecological function of the community.
- Have a substantial adverse effect on federally protected wetlands as defined by Clean Water Act section 404 (including, but not limited to, marshes and vernal pools) through direct removal, filling, hydrological interruption, or other means. For purposes of this analysis, substantial adverse effects on federally protected wetlands are defined as effects that result in the overall reduction of the current extent or ecological function of wetlands.

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. For purposes of this analysis, substantial interference with the movement of fish species are defined as effects that permanently block (e.g., dams) or seasonally impede (e.g., insufficient water depths) fish movement.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. For purposes of this analysis, a fundamental conflict with a local plan or ordinance is defined as any action that substantially conflicts with the terms of such policies or ordinances.
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan. For purposes of this analysis, a fundamental conflict with an adopted habitat conservation plan is defined as any action that would substantially conflict with the terms of such a plan.

Impact Analysis

As discussed earlier in this Draft EIR, some of the activities the Program proposes to authorize through the issuance of SAAs and sub-permits are historic, ongoing activities that, along with the impacts they have had on the physical conditions in the Program Area, are part of the existing environmental setting. These include water diversions that the Program proposes to authorize to bring them into compliance with Fish and Game Code, § 1600 *et seq.* and CESA. As a result, authorizing existing water diversions and the activities related to them will not further degrade the physical conditions in the Program Area or elsewhere, or cause the number of water diversions or the amount of water diverted to increase. In fact, it is expected that the overall amount of water diverted in the Program Area will decrease at certain times of the year after the Program is implemented due to the terms and conditions in the SAAs, ITP, and sub-permits that CDFG issues under the Program. Further, the existing water diversions and related activities will continue whether or not the Program is implemented. However, by implementing the Program, the fisheries and aquatic habitat conditions are expected to improve as a result of the implementation of many of the terms and conditions in the SAAs, ITP, and sub-permits that CDFG would issue under the Program. Those terms and conditions are described in Chapter 2 and Appendices A and B of this Draft EIR. Again, it is important to emphasize that these terms and conditions are not mitigation measures CDFG has identified to reduce the level of impacts to less than significant as required by CEQA; rather they are measures that which avoid and minimize impacts in accordance with the Program participants' statutory obligations under Fish and Game Code, § 1600 *et seq.* and CESA.

Impact 3.3-1: Construction, maintenance, and other instream activities associated with various Covered Activities may result in impacts to fisheries resources and their habitat (Significant).

In addition to the discussion below, please refer to the similar description of impacts and mitigation measures from a hydrological perspective under Impact 3.2-1 in Chapter 3.2.

Implementation of several of the Covered Activities would involve new construction activities within stream channels and/or upland areas in close proximity to channels. Instream construction activities would be required for projects that involve the construction of new headgates, fish screens, stream access and crossings, instream habitat structures, and barrier removal/fish passage, as well as the maintenance and repair of existing structures (e.g., due to flood damage). Projects requiring construction and maintenance activities in upland or floodplain areas include the installation of fencing and riparian restoration/revegetation.

Most of these construction and maintenance activities would require some degree of ground clearing, channel and bank excavation, backfilling, earthmoving, stockpiling and/or compaction, grading, and concrete work. These activities may result in the following significant impacts to coho salmon, CDFG fish species of special concern, and other fisheries resources:

Short-term increases in sedimentation and turbidity. Increased sedimentation rates could result if fine sediment is discharged to streams or mobilized within channels during project activities. Increased sedimentation may adversely affect water quality and channel substrate composition. Specific rates of sedimentation are dependant upon the duration, volume, and frequency at which sediments are contributed to the surface water flow. Substantial sedimentation rates may smother fish eggs and fish food (i.e., benthic invertebrates), degrade spawning habitat, and fill pools. Furthermore, suspended sediments increase the turbidity of the water. High rates of turbidity can result in direct mortality or deleterious sublethal effects (e.g., gill abrasion, decreased visibility during foraging) to fish.

Accidental spills and use of hazardous materials. Equipment refueling, fluid leakage, and maintenance activities within or near-stream channels pose a risk of accidental water contamination that may result in injury or death to coho salmon and other fish species. Many commonly used hydraulic fluids contain organophosphate ester additives that are toxic to salmonids and other fish species. Acute lethal and sublethal effects have been documented in salmonids in particular (as opposed to warm water species). Leaks or spills of petroleum hydrocarbon products found in construction equipment have similar adverse effects on fish.

Furthermore, when surface water comes into contact with uncured concrete, either through accidental spills of concrete or through contact with recently-poured structures (e.g., headgates, fish screens), alkaline substances in the concrete may leach into the water, resulting in decreases in the natural hydrogen ion concentration (pH). Rapid changes in the pH of the stream water can have adverse effects on fish, particularly if the hydrogen ion concentration is reduced such that the pH reading increases above nine.

Direct injury or mortality resulting from equipment use and dewatering activities. During instream construction activities, fish species may be crushed by earth moving equipment, construction debris, and worker foot traffic. It is therefore necessary to isolate the work area from actively flowing water through the use of coffer dams and dewatering pumps. However, dewatering activities can lead to fish becoming concentrated or stranded in residual wetted areas. Thus, if coho salmon and CDFG fish species of special concern are known to or assumed to occur in the project area, capture and relocation procedures need to be implemented prior to

construction. Capture and relocation efforts, in turn, may also result in injury or mortality to fish if not conducted by a qualified biologist according to established guidelines.

Temporary loss, alteration, or reduction of habitat. In-channel construction activities, the use of construction equipment in stream channels, workspace dewatering, and clearing of riparian vegetation for work site access may result in temporary impacts to the habitat of coho salmon and CDFG fish species of special concern. Potential adverse impacts that may occur include alterations of the stream substrate composition and channel integrity. Riparian vegetation is an important component of coho salmon habitat, providing channel shading, bank stability and complexity, instream cover in the form of LWD, and an important source of organic matter and food. The temporary loss of riparian vegetation may result in increased soil erosion, elevated water temperatures, and loss of fisheries habitat complexity.

Mitigation Measures Proposed as Part of the Program

Mitigation Measure 3.3-1a: Implementation of ITP General Conditions (g) Instream work period, (h) Instream equipment work period, and (i) Compliance with Fish and Game Code, § 1600 *et seq.* (Article XIII.E.1) would avoid or minimize potential direct and indirect impacts to coho salmon and CDFG fish species of special concern resulting from instream construction and maintenance activities.

Mitigation Measure 3.3-1b: Implementation of numerous applicable conditions in the MLTC would further avoid or minimize potential direct and indirect impacts to coho salmon and CDFG fish species of special concern resulting from instream and upland construction and maintenance activities.

Mitigation Measures Identified in this Draft EIR

Mitigation Measure 3.3-1c: ITP General Conditions (g) and (h) (Article XIII.E.1) limit the season for instream equipment operations and work related to structural restoration projects to the period of July 1 through October 31. Similarly, ITP Additional Avoidance and Minimization Measure D (Livestock and Vehicle Crossings) and conditions in the MLTC limit the use of stream crossings to the same period. However, based on adult coho salmon observations in the Scott River (Quigley, 2006a), as well as documented migration timing in the adjacent Shasta River watershed (Hampton, 2006), coho salmon may enter the Scott River prior to October 31. Furthermore, the Chinook salmon spawning season occurs even earlier in the season, depending on streamflows. Therefore, as specified under Mitigation Measure 3.2-1d (Chapter 3.2 Geomorphology, Hydrology, and Water Quality), the season for instream construction activities, equipment operations, and stream crossing utilization shall be limited to the period of July 1 through October 15. If weather conditions permit and the stream is dry or at its lowest flow, instream construction activities and equipment operations may continue after October 15, provided a written request is made to CDFG at least five days before the proposed work period variance. Written approval from CDFG for the proposed work period variance must be received by SQRCD or Agricultural Operator prior to the start or continuation of work after October 15.

If work is performed after October 15 as provided above, SQRCD or Agricultural Operator will do all of the following:

- Monitor the 72 hour forecast from the National Weather Service. When there is a forecast of more than 30 percent chance of rain, or at the onset of any precipitation, the work shall cease.
- Stage erosion and sediment control materials at the work site. When there is a forecast of more than 30 percent chance of rain, or at the onset of any precipitation, implement erosion and sediment control measures.

Level of Significance after Mitigation

Implementation of the Program, including the mitigation measure discussed above, would reduce potential impacts of construction, maintenance, and other instream activities to coho salmon and CDFG fish species of special concern and their habitat to a less-than-significant level.

Impact 3.3-2: Increased extraction of groundwater could contribute to decreased baseflows and increased ambient water temperatures in the Scott River and its tributaries, thereby impacting coldwater fish habitat (Less than Significant).

As part of the Program, groundwater may be utilized in place of surface water supplies. In particular, under ITP Mitigation Obligations of SQRCD (a)(iv) (Article XIII.E.2) groundwater supplies may be used as one alternative means of satisfying stock water demands from October through December (the other alternatives being off-stream storage or other appropriate methods). This measure is intended to enhance surface flows during dry conditions and during critical times of the year (October through December) in order to improve salmonid habitat.

However, as discussed in Impact 3.2-4 in Chapter 3.2, increased use of groundwater during dry conditions in order to curb the consumptive use of surface water, as proposed by the Program, could decrease groundwater discharge into the Scott River and its tributaries. A reduction in groundwater discharge could decrease base flow volumes and could contribute to increased water temperatures. In general, the aquifer characteristics and the interaction of groundwater and surface water within the Scott Valley are poorly understood. However, there are some general properties and relationships among groundwater and surface water that *are* understood. The permeability of alluvium within the Scott Valley can vary by orders of magnitude, and groundwater moving through these deposits is an important source of recharge to surface channels (Mack, 1958). Further, groundwater inflows are a primary driver of stream temperatures in the Scott Valley and groundwater accretion directly affects stream temperatures by addition of cold water (NCRWQCB, 2005). Utilizing groundwater instead of surface water has the potential to elevate stream temperatures (Naman, 2005). During low flow conditions, if groundwater is pumped in proximity of a flowing stream or a subsurface channel such that subterranean flow is impacted, then that groundwater extraction could result in a decrease in instream flow and, concomitantly, an increase in water temperatures in the nearby stream.

Notwithstanding the above, any increase in groundwater use under the Program is expected to be low for the following reasons: 1) the proposed scale of the alternative stock watering system is

small; the Program specifies the installation of two systems per year within the entire Program Area; 2) not all such systems would necessarily use groundwater, as alternative methods are also proposed; 3) groundwater irrigation tends to cost more (for well installation, piping, and power costs); and 4) the availability of groundwater resources in the Scott Valley varies greatly from location to location.

Because it is not likely that the Program would cause a substantial increase in the use of groundwater, the level of any impacts associated with such use would be low. Further, for the season in which this system is proposed for use, October through December, the *volume* of streamflow is more of a concern for salmonid habitat than the temperature of the water. High water temperatures are of principal concern and exert more influence on limiting salmonid habitat in the late spring and summer months. In addition, some Agricultural Operators must divert much more surface water than is needed to satisfy their stock-watering needs, because a higher volume of water is necessary to enable water to flow from the point of diversion to the point of use to accommodate for carriage loss due to varying delivery efficiencies (Black, 2008). Hence, in some cases, substitution of groundwater for surface water would result in a substantial reduction in the amount of water diverted

As such, with respect to the impact that alternative stock watering systems may have on surface water temperatures, and thus fisheries and aquatic habitat, this potential impact is less than significant.

Mitigation Measures Identified in this Draft EIR

This potential impact was determined to be less than significant. No mitigation measures required.

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